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Volume 54 Number 6

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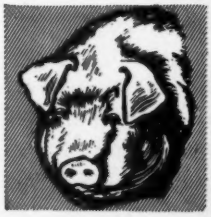

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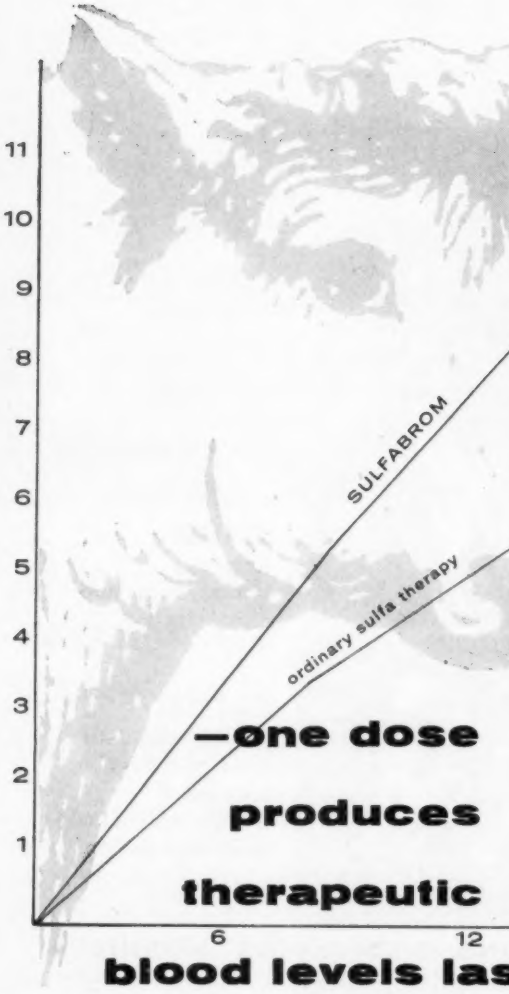

More than any other professional man, the practicing veterinarian knows that his most valuable asset is time. In any area of his practice, the success of his therapy cannot be measured by results alone; he is a busy man whose time must be used judiciously.

Well aware of this problem, Merck research workers have designed an antibacterial agent which, from its conception, was meant to satisfy the particular needs of the veterinarian. In cattle, this new drug produces effective therapeutic blood levels for at least two days, freeing the veterinarian from time-consuming return calls and minimizing stress-producing handling.

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tract

infection

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new, exclusive veterinary dosage form

pleasant tasting • easily administered • readily retained

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REFERENCES: 1. Mosier, J. E., and Coles, E. H.: Vet. Med. 53:649 (Dec.) 1958. 2. Belloff, G. B.: Calif. Vet. 9:27 (Sept.-Oct.) 1956. 3. Mosier, J. E.: Vet. Med. 52:445 (Sept.) 1957.

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REFERENCES: 1. Pollock, S.: Control of Nonspecific and Specific Enteritis in the Dog; read at the First Regional Conference on the Nitrofurans in Veterinary Medicine, Wilmington, Delaware (June 5, 1958). 2. Fisher, G. W.: Oral Use of Furadex in Canine Diarrhea, N. A. Vet. **39**:133-134 (Mar. 15) 1958.

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REFERENCES: 1. Vickers, C. L.: Personal communication. 2. Filion, R., and Trepanier, M.: Personal communication. 3. Lannek, N., and Brag, S.: Vet. Med. 49:75-78 (Feb.) 1954. 4. Felgate, C. A., and Swann, H. C.: Vet. Rec. 68:259-262 (May 5) 1956. 5. Guthrie, J. E.: Vet Med. 47:307-314 (Aug.) 1952. 6. Guthrie, J. E.: Personal communication.

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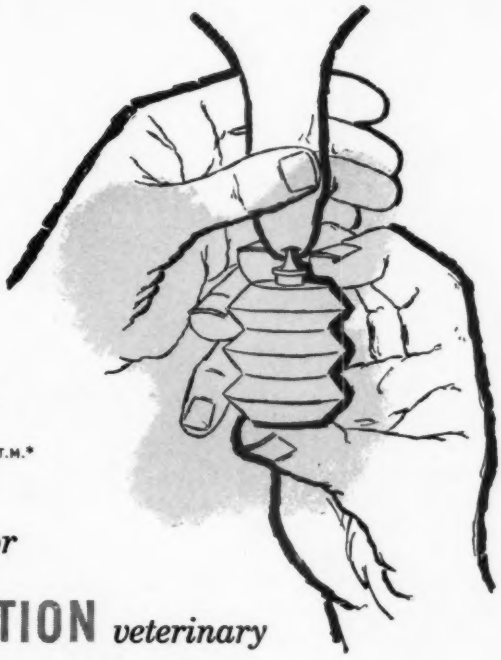

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single-dose dispenser for

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- unique package

*design patented

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1. Mires, M. H., and Chadwick, R. H.: Vet. News 10:3 (Jan.-Feb.) 1947. 2. Mires, M. H.: J. Am. Vet. M. Ass. 117:49 (July) 1950.

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actual size

Aerosol

diphemanil methylsulfate 1%

promotes more rapid healing, greater comfort in

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- nonspecific dermatitis
- VARITON Aerosol applied to sutured areas may prevent chewing or clawing
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VARITON Aerosol 1%, 85 Gm. container, box of 12, and
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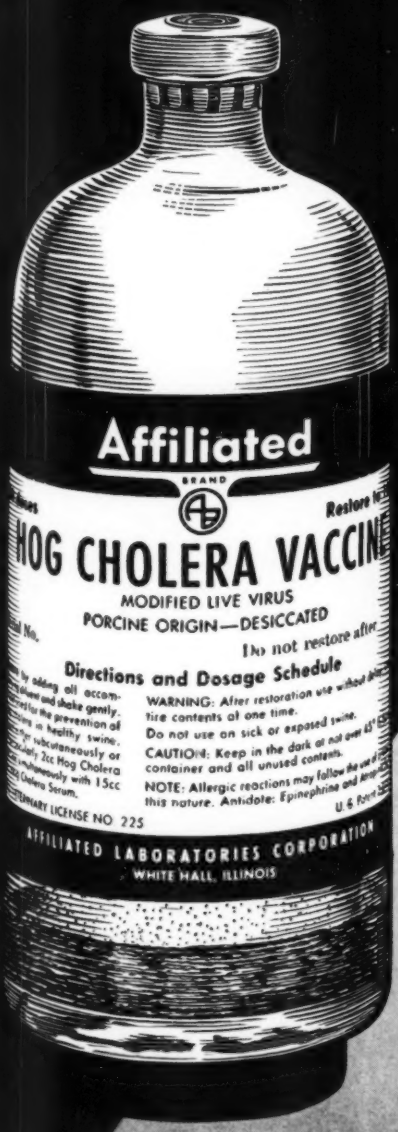
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Do not restore after
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Do not use on sick or exposed swine.
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News Comment

Control of Ringworm

Dermatologists at Children's Hospital, Washington, D.C., report that Meticorten, administered orally, is remarkably effective in curing stubborn ringworm of the scalp.

A simple cure for ringworm effective in both man and animals has been developed by Dr. S. G. Knight, University of Wisconsin bacteriologist. Glycerol triacetate, an inexpensive, non-toxic, non-irritating liquid raises the acidity of the affected parts and finally kills the fungus which produces the disease.

This treatment has been used successfully on grade school boys near Madison during an epidemic. It is also effective in animals. Medicine containing the new material will soon be on the market, Doctor Knight reported.

Corporation Farms

Corporation farms are not likely to eliminate the smaller operation, or family-sized farm, according to one manager of a corporation farm in Ohio. "We have too big a payroll to meet. Takes $50. an acre gross to break even."

Antibiotics in Dog Food

Permission to market antibiotic-containing dog food has not been granted by Food and Drug Administration officials, and any distribution of such products may be in violation of the Food and Drug Act.

According to Dr. LaVerne C. Harold, F.D.A. spokesman, "Before penicillin, streptomycin, chlortetracycline, chloramphenicol, or bacitracin, or any derivative of any of these antibiotics, may be lawfully added to the dog food intended for use in the prevention or treatment of disease or as a growth stimulant, it would be necessary that the antibiotic regulation be amended to include the preparation. Proof that the drug is safe and efficacious for the uses proposed is necessary before the required amendments can issue. As yet, we have received no such proof."

X-Ray Diagnoses of Pregnancy

Pregnancy in a bitch can be diagnosed with x-rays during the fifth week of the gestation period, according to a group of French researchers in the Record Medicine Veterinaire. Prior to radiography, the animal is fed only liquid diet for 24 hours, given a mild purgative, and the bladder is emptied.

Cultured Solid Tumor Virus

Investigators have demonstrated recently the existence of a virus that produces solid tumors in a variety of animals. It can be grown in tissue culture, and can produce active and passive immunity. Although the work is not presently applicable to human cancer, its major implications are in the field of human cancer research, according to Medical News report.

Dairy Farm Move

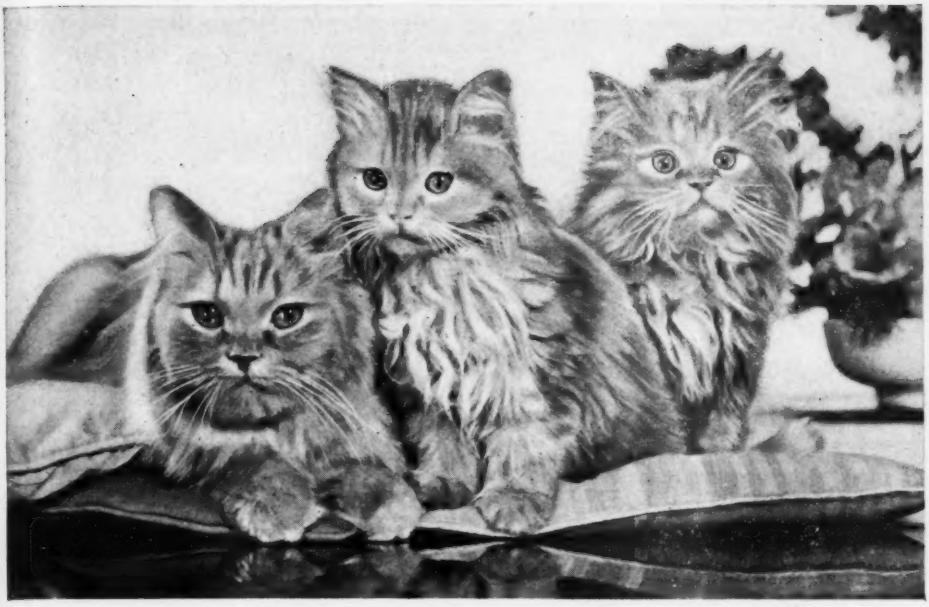
Farmer control of milk from cow to bottle may be the next dairying move, according to recent Farm Journal report. "The Twin Cities Milk Producers' Association has just bought the processing and bottling facilities of two milk companies—one with a daily capacity of 200,000 lbs. of milk. For the big milk supply co-op and its 5,000 farmer members, it means control over the production, processing and packaging of 20 to 25% of the milk it sells in Minneapolis."

Twinning in Cattle

Experiments to produce twinning in cattle have been pursued in England since 1939, the procedure may become practical in the near future, according to a report in the Farmer's Digest. Eggs shed by the cow at heat are determined by follicle stimulating hormones. A substitute can be obtained from mares between the 45 and 90th day of pregnancy. Injected into the cow four days before heat period is due causes multiple eggs to ripen. Appropriate doses can produce twins and triplets. Experiments are still in progress.

Virulent Hog Cholera Virus Banned in 23 States

Prohibition of the use of virulent hog cholera virus has passed the half way mark on the basis of hog production with the addition of five more states to the list banning the product. The 23 states which now prevent the use of virulent virus produce a total of 57% of the hogs in the United States. Biggest boost to the list came with passage in the number one hog state, Iowa, of a measure by the state legislature banning use of virus except in case of emergency. West Virginia, Texas, Oregon and South Dakota have also by law or regulation halted use of virulent virus.



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And complete health is based on a well-rounded, nourishing diet

There is a variety of reasons why so many experts in animal nutrition recommend Puss 'n Boots cat food, but the major one is that Puss 'n Boots contains not just one, but a *blend* of healthful ingredients.

Like a balanced meal for human consumption, each ingredient in Puss 'n Boots contributes its special benefit to the overall vitality and handsomeness of a well fed cat.

In itself, whole fish provides a natural storehouse of vitamins, minerals, and proteins. But the makers of Puss 'n Boots, on the advice of animal nutritionists, have also added selected cereals. And on top of *that* extra quantities of Vitamins B_1 and E.

The end result is that each can of Puss 'n Boots contains a full complement of nutrients—all the nutrients a cat is known to need. Thus when you recommend Puss 'n Boots you can be certain you're guiding the pet owner toward more pleasure for himself... through ownership of a cat which is in top looks and health.

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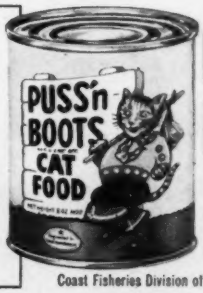
Liver and Glands, for minerals and vitamins. Vital for health. Often extracted for medicinal use, but retained in Puss 'n Boots.

Bone Structure, for valuable calcium and phosphorus. Made crumbly and digestible, and retained in healthful Puss 'n Boots.



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Condition	Total Number	Good to Excellent Results
Weeping dermatitis ("Moist Eczema")	217	200-(92%)
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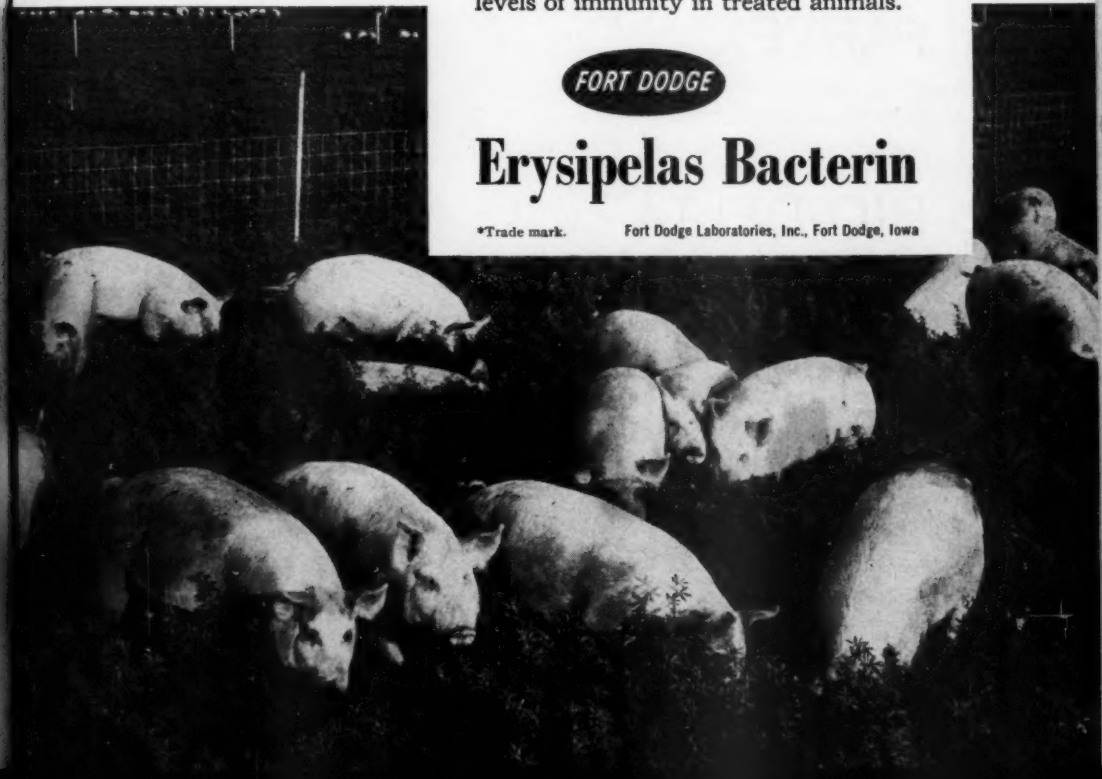

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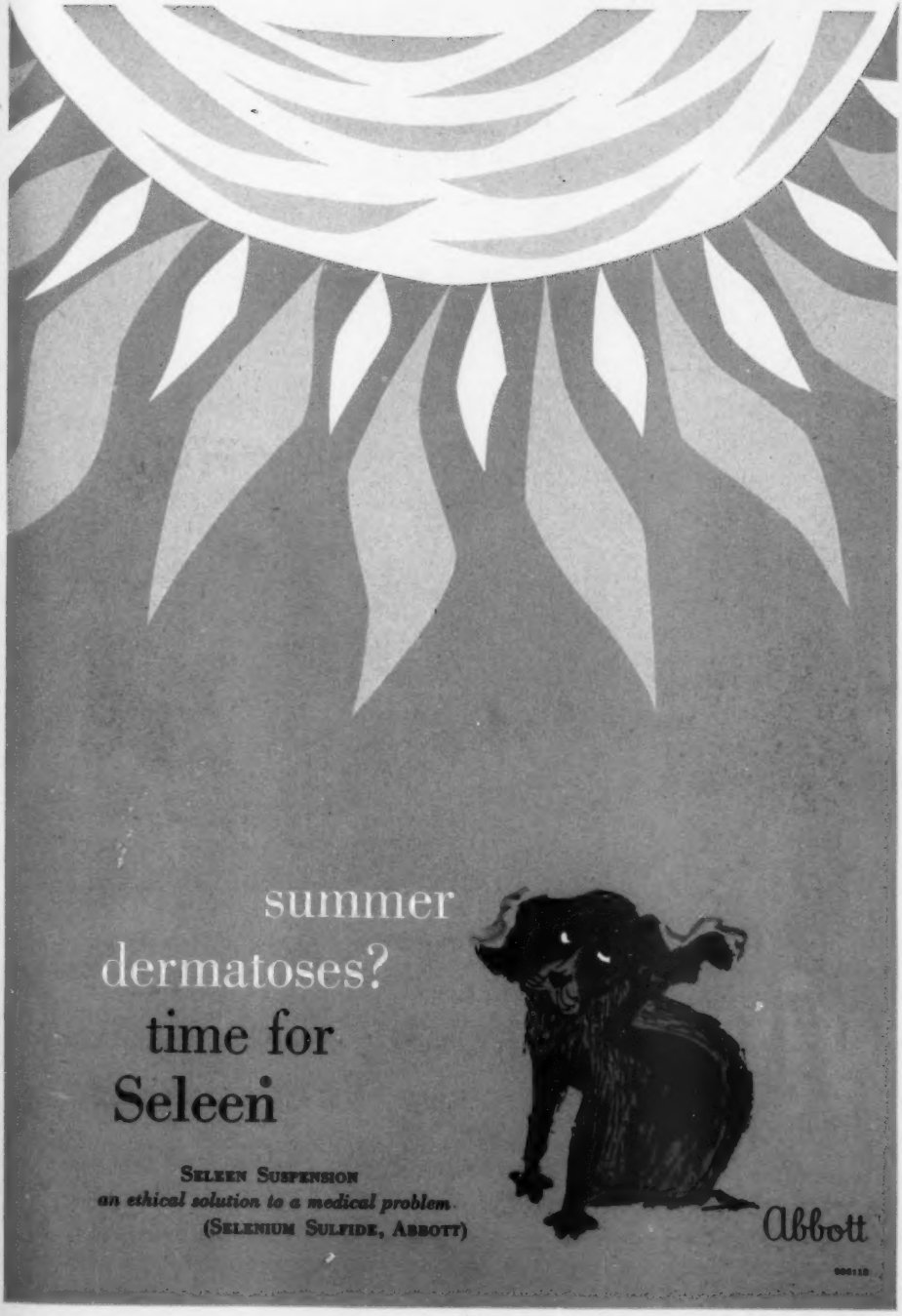
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A Dairy Herd Reproduction Program

ERWIN M. PLOCHER, D.V.M.

Watsonville, California

THE ROLE OF THE VETERINARIAN in the management of animal production is increasing in importance. Today many clients regularly depend upon the veterinarian's participation. The future holds even more opportunities in all phases of veterinary work: poultry, sheep, swine, horses, beef cattle and milk production. This report deals only with the dairy industry.

According to a recent release by the Dairy Industry Advisory Board of California, milk is now the most important of California's 250 agricultural crop products. Dairy farmers alone have an investment of approximately $1 billion. They employ more than 300,000 persons with an annual pay roll of well over $80 million. Farm marketing of milk and cream approximates $356 million or close to $1 million a day. These figures do not represent retail values, but market values.

Presented at the Midwinter Conference of the California Veterinary Medical Association at Davis, California, February 2-4, 1959.

Sanitary requirements, more efficient equipment and well-designed working layouts have plunged dairymen into the realm of high finance. They have a great deal at stake. High daily returns are necessary because they add up to high monthly and yearly income. Yearly herd averages are important in this business. Basically, cows must produce. It is at this point that veterinarians may play a most important role in helping the dairy animals maintain production.

Review of Literature

Amstutz[1] has presented discussions on the trend toward herd health programs. He has noted quite plainly and forcefully that it is

the dairyman's healthy cows that pay the bills.

Diagnosis and therapy have been covered by Stoll[3] who has published information on his experiences as a practitioner in Pennsylvania. He stresses the importance of obtaining an accurate and complete history on each cow and the art of keen observation during genital examination. Hardenbrook[2] has presented a logical approach to the use of estrus and breeding records in evaluation of the problem breeder cows. He also has pointed out the value of uterine culture, mentioning the necessity of aseptic technic until completely through the cervix and out again.

The economic aspect of veterinary services in dairy herds is a problem in itself. Reference is made to the opinions of Drs. J. F. Bone[4] and John B. Herrick for a 1958 approach to the subject of economical handling of reproductive malfunctions in cattle.

Gibbons[5] has presented a complete review of a dairy program which involved only regular monthly visits. In his report, Gibbons shows in chart form the incidence of clinical genital diseases. Anestrus constituted more than 50% of all cases, whereas another 20% involved infertility. He gives a list of conceptions at different inseminations as follows: 48% conceived on the first insemination, 19.2% on the second, and 14.9% on the third; 82.1% conceived within three services.

The incidence of disease rises in herds with higher production. Herrick[6] presents facts that show a 277 pound herd with a conception rate of 1.72 and a 12 month calving interval; a 350 pound herd with a 2.0 conception rate and a 13 month interval; a 410 pound herd with a 2.4 conception rate and a 14 month interval; and finally a 502 pound herd with a 2.8 conception rate and a 15 month calving interval. The veterinary costs were some three times higher in the 502 pound herd than in the 277 pound herd.

A breeding-rest fertility program was instigated by Huber[7] of Illinois. During this program Huber treated cows 20 to 45 days postpartum and made genital examinations of these cows at the same time. He and the owner learned that he was finding abnormalities at these examinations which could be corrected.

The specific points that have been covered help fortify the program economically, scientifically and professionally.

Previous Herd History

The particular dairy herd referred to in this presentation was an above average herd of 220 cows. About 80% of the herd were Holsteins; the remaining 20% were Jerseys. Veterinary service was not new to this dairy when this work began in September 1952. The herd had been receiving very good veterinary services. The practitioner would be called at intervals to take care of problem cows and leave a supply of drugs with instructions for the herdsman. Herd records were excellent for their use, but the only record on an individual cow basis was in the DHIA test book, which made it actually unavailable to the herdsman and practitioner except once a month.

JANUARY	FEBRUARY	MARCH	APRIL

SIRE: DAM:

Date Fresh	Calf. Sire	Sex	No.	Dates Inheat	

Date	Clinical Notes and Remarks

The writer practices from a town ten miles from the dairy and was able to work out a program with the manager. This program spelled out the responsibilities of the veterinarian, the herdsman and the manager. The veterinarian's responsibilities were divided into four areas: (1) mastitis control, (2) reproduction, (3) overall herd health (calfhood diseases etc.) and (4) consultation in herd nutrition. This presentation is limited to the herd reproduction program.

Program

A separate set of individual cow cards* was set up. Colored tabs indicated the state of reproduction of each cow. These records were kept by the herdsman.

Visits were made to the dairy once a week for reproductive examination and therapy. Post parturient examinations were made on every cow between the third and fourth weeks. Both a rectal palpation and a vaginal specula examination were carried out at this time. The condition of the ovaries was recorded along with the size and tone of the uterus. Notes were made of the character of the vagina and the mouth of the cervix. It was decided at this examination if the cow was clean and ready to breed when she passed the 60 day mark. If not clean, therapy was decided and recorded as such. In most cases the animal was examined again the next week.

The first calf heifers were to be bred back at 80 to 90 days, whereas the remainder of the herd was bred back at 60 days. If a cow approached this date without a heat period, she was brought in for re-examination and steps taken, if necessary, to start her estrus cycle. She was examined again in a week if estrus was not noticed. All cows were artificially inseminated in this herd. Thirty-five to 42 days after insemination, each cow was brought in for a preg-

*Acknowledgment is given to R. E. Bowen, manager, and Dale Newcomb, herdsman, for their fine cooperation and assistance in gathering data.

RECORD CARD

PRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER

DATE OF BIRTH: NAME or HERD No.

Breeding Record						Date Due	Date Dry	Fat Record	Milk Record		
Date	Bull	Date	Bull	Date	Bull						

	Date	Clinical Notes and Remarks

nancy examination. If there was doubt concerning a pregnancy at this examination, the ovaries were examined closely and their condition recorded; the same cow was seen again the following week.

If a cow had a history of trouble cleaning up after calving or was a repeat breeder, her pregnancy was rechecked a month later to establish two positive pregnancy diagnoses. This plan of examinations worked because the herdsman knew each cow and he was interested in the cows and their ultimate production. The records were a tool for both the herdsman and practitioner so they were set up to work for both. (See cut for record card.)

The Record System

When a cow freshened, a yellow tab was placed on her card at a date three weeks later. During that week she was brought in for post parturient examination. If cleared for breeding, the yellow tab was removed and a green tab placed on the card for the week the cow was ready to be bred. If she was not cleared, the yellow tab was moved forward to the date she was next to be examined. When a cow was inseminated, the green tab was removed and a blue tab was placed on the week of insemination, thus five to six weeks later all blue tabs for that week were brought in for pregnancy examinations. When a cow was pronounced pregnant, the blue tab was taken off and a red tab placed in the week she was to be dried up. When dry, the red tab was removed and a brown tab placed on the week the animal was to freshen. Upon freshening, the brown tab was removed and a yellow tab placed again.

By using this system the herdsman could make out his list of cows for the practitioner to examine by making a vertical check of the current week. All yellow tabs were to come in and all blue tabs from five to six weeks back were brought in for pregnancy examinations. All green tabs from one week ahead known to have shown no heat were brought in for re-examination. Vital statistics were kept by the herdsman on half of the card while the other half was used to record the results of examinations made by the veterinarian.

The herdsman was instructed to hold for examination all cows that had been inseminated for a third time. This examination was made the week following the third service. The purpose of this examination was to establish whether or not the cow showed any signs of infection by discoloration of the cervical discharge and to establish the existence of a *corpus luteum* on either ovary.

Retained placenta was manually removed in about half of the cases. Either Terramycin (Pfizer) or Furea boltabs (Eaton) were placed in the uterus in all cases. Fifty milligrams of stilbesterol were given to all cases. If a cow showed signs of clinical systemic illness she was treated accordingly in addition to routine uterine therapy.

At the post parturient examination, when large amounts of pus were found and uterine tone was poor, a heavy dose of stilbesterol or repositol stilbesterol was administered. This was usually followed by a repeat examination in one or two weeks when a uterine medication was infused (5% Neoprontosil [Winthrop] 250 cc. or 30 cc. suspension of Nolvasan—[Fort Dodge]). When traces of pus or just white flakes were seen and the estrus cycle was established, no hormone therapy was given. Nolvasan was given or prescribed for one day after next estrus. Embryostat (Pfizer) in double dose was also used in some cases.

Anestrus is the most frequent problem in this dairy. There is no substitute for an alert group of men at a dairy. The corral men, feed men and milkers all work together reporting to the herdsman any cow suspicious of estrus. This history is a must in treating and prescribing for the anestrus cow. The writer tried to establish the presence or absence of active *corpus luteum* and/or a growing follicle. If the cow was a high producer she was given a little time with the ovarian changes to be checked again in one week. Manual removal of *corpus luteum* was practiced in some cases. This usually resulted in estrus within ten days. Some specialists do not approve of this therapy, but it brings results in most cases. Danger of hemorrhage tends to discourage this procedure. Diethylstilbesterol (50 mg.) was administered intramuscularly to start an estrus cycle if there was a

TABLE 1. Length of Calving Interval (721 Intervals — Average 12.6 Months)

Time (months)	11	12	13	14	15	16	17	18+
No. intervals	144	319	114	76	21	16	17	14

TABLE 2. Production

	1952	1953	1954	1955	1956	1957
Cows in herd	220	235	232	244	259	295
Av. lb. B.F./cow	401	458	476	478	475	512

Note the increase in average yearly production.

possible follicle and no *corpus luteum*. If no ovarian changes were noted at the next examination, FSH (Armour) was used and the cow given more time to conceive.

The most difficult to handle is the cow that comes in for examination after a third insemination. Rectal examination is made to establish the presence of an active *corpus luteum*. If there is no *corpus luteum*, then a visit is scheduled for the cow's next heat for possible use of a luteinizing hormone at the next insemination. A vaginal examination is made to establish whether the cow is still clean or shows an off-colored discharge from the cervix. A treatment of Embryostat or Neoprontosil (Winthrop) is used 24 to 72 hours after insemination with some success. When a considerable amount of discharge is noted in this repeat cow, she is taken off the breeding list until the uterine condition is cleared up. For a chronic metritis, treatments within three days after estrus are prescribed. Because of the changing tone of the uterus and the cervix during the complete estrus cycle, every examination includes both a rectal palpation and a visual vaginal inspection.

Estrus after conception has occurred in this dairy and agrees with the 5 to 6% occurrence reported in the literature. The cow is sometimes inseminated in the posterior end of the cervix, but she is always brought in for pregnancy re-check as soon as possible.

We must bear in mind that culling was controlled by the manager. He asked the advice of the herdsman on production and barn habits of some cows. He submitted a list of cows to the veterinarian for advice when cows being considered for culling were not yet pregnant. The established policy called for treatment in order to establish pregnancy unless other instructions were given on specific cows. This presented a challenge and an opportunity to practice veterinary medicine. This culling policy must be kept in mind when considering the number of inseminations per year as compared to the number of established pregnancies. This policy will be reflected in all the results presented.

Results

What has this program done for this herd? In order to answer the question we should have measuring devices available to check progress on reproductive health. Charts and nomenclature are inadequate, but by making several surveys and summaries the author has made an attempt to evaluate the situation. The figures used represent only the first four years of the program: 1953, 1954, 1955, and 1956, except table 2, which includes one year prior to initiation of the program and the fifth year of the program.

The facts revealed in Table 5 are very rewarding. Of the 901 pregnancies considered, 51% of them were first service, another 25% was picked up on the second service; by the third service 89½% of the cows were pregnant.

Summary

1. A four year program of preventive medicine has been presented.

TABLE 3. Clinical Genital Diseases

	1953	1954	1955	1956	Total
Anestrus	14	74	64	35	217
Cystic Ovaries	0	9	6	5	20
Salpingitis	0	0	1	0	1
Abortion	3	2	3	6	14
Dead calf term	2	2	4	1	9
Prolapsed uterus	0	0	0	1	1
Dystocia	2	3	1	3	9
Retained placenta	3	3	14	3	23
Endometritis	8	10	27	46	91
Chronic metritis	3	22	57	25	107

TABLE 4. Services/Pregnancies

	1953	1954	1955	1956
Services	297	476	647	522
Pregnancies	183	230	282	206
Ratio	1.63/1	2.07/1	2.3/1	2.54/1

Because the problem cows were kept in the herd, the number of services per pregnancy was higher than in herds where problem cows were culled.

2. The results in this herd have supported facts presented earlier that the higher producing cow has a less active genital tract than the lower producing cow, thus more likely to become infected or otherwise involved.

3. Infertility is not going to be eliminated by continued work on the part of the veterinarian. Infertility can be recognized and minimized by proper program and therapy.

4. The manager of this dairy considers veterinary service a worthwhile investment; this is evidenced by the fact that the program now is into its seventh year.

5. The important point noted in this presentation is that there is a *program*. The cows are given as much help as they need from the entire staff to maintain their health —healthy genital tracts, and ultimately their high production.

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TABLE 5. Pregnancy Distribution (901 Total)

No. of Inseminations	1	2	3	4	5	6	7	8+
No. of Pregnancies	455	226	123	47	20	11	8	14
Approx. % of Total	51	25	13½	5	2¼	1¼	1	1½

19 cows were culled as not pregnant.

Blotting Paper Disks Aid Serum Testing

A new technic developed by University of Wisconsin veterinary scientists makes it easier and less expensive to ship and handle blood serum samples for virus testing.

Small dime-size disks of blotting paper absorb serum samples. After drying, such disks can be mailed to the testing location where serum antibodies are dissolved from the blotting paper and subjected to the usual testing procedures.

No mechanical refrigeration is needed for the blotting paper disks. A four cent stamp can pay the postage for many samples, which formerly would have had to be frozen and mailed air express in a large box.

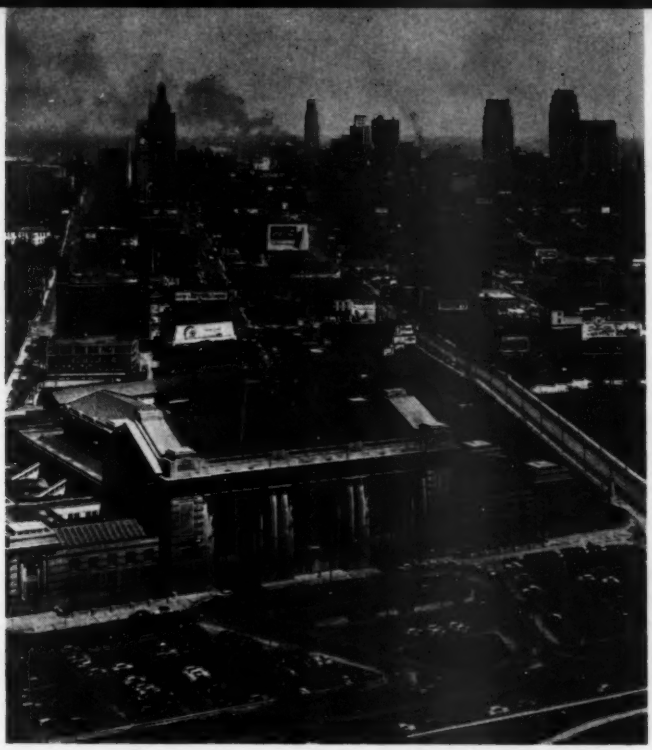
Sending dried samples through the mail is less dangerous to public health than shipping fluid samples, the veterinarians feel.

They also learned that the blotting paper method gets rid of some "non-specific" antibodies which may cause confusion in the interpretation of the tests.

The testing procedure will be especially helpful in surveys aimed at eradication of virus diseases over a large area such as a state.

So far the technic has been used successfully in Wisconsin work with vesicular stomatitis, Newcastle disease, and equine encephalitis. In the stomatitis work, blood samples of trapped or shot wild animals and birds in the southern part of the nation were taken and shipped to Wisconsin.

The researchers on the project merely dipped the blotting paper disks into the animal's blood, then dried them, and shipped them in large lots for testing.— *What's New in Farm Science, Bull. 526.*



1959 A.V.M.A. MEETING

TO BE HELD IN KANSAS CITY—AUGUST 23-27

AN UNUSUAL DIVERSITY of attractions awaits veterinarians who will attend the Third Pan American Congress of Veterinary Medicine and the Ninety-Sixth Annual Meeting of the American Veterinary Medical Association, August 23-27, 1959, in Kansas City. The Heart of America is a land of variety, with new places to go, new sights to see, and exciting things to do. When the Joint Session of the veterinary groups gets under way, it will proceed with the knowledge that "everything's up to date in Kansas City." Air conditioned facilities take the sting out of mid-America's summer, and compact hotel and travel arrangements make a trip to Kansas City a memorable occasion.

The scientific program of the Joint Meeting will be presented in general sessions and in several sectional meetings. Topics will include all aspects of veterinary medical practice, research, livestock sanitary regulations, animal husbandry and zoo technics. Scientific and commercial exhibits will complement the technical program for Latin America visitors.

The A.V.M.A. meeting itself will tie in with the Joint Meeting and present the veterinarian with a rare opportunity

to understand his colleagues from Pan American countries. In addition to the regular convention program, there will be a number of social entertainment features. In conjunction with the meeting, the grand diversity of mid-America is open to the veterinarians who come to Kansas City this summer.

In music halls the world over, the lyrics of a popular stage show ditty have proclaimed that "everything's up to date in Kansas City." Veterinarians, their wives and children will quite likely hum the tune this summer as they enjoy the convention city's myriad attractions, shop in its smart retail stores, stop at its modern hotels and visit its fine restaurants and supper clubs. A major league baseball club, music under the stars at Starlight Theater in Swope Park, a famous art gallery and museum, and a colorful zoo invite attention.

Since its dedication in 1957, the Harry S. Truman Library has attracted 144,000 persons. Known as the "Summer White House" during Truman's administration, the home of the former president at 219 Delaware in Independence is a magnet for visitors. Independence is a stone's throw from Kansas City.

Convention guests can relax in the beautiful parks, play tennis or shoot golf on the city's many courses. Fans can converge on Municipal Stadium to see the Heart of America's own "fighting Athletics" play host to Washington and Baltimore during the A.V.M.A. Convention.

But first, last and always, Kansas City's Municipal Auditorium is one of America's finest convention and exposition facilities. Located in the heart of downtown Kansas City — five minutes from the airport — it is air conditioned and completely equipped for convention purposes. Adjoining by tunnel is an underground parking facility.

Approach by Air

Traveling veterinarians who fly to Kansas City will find that the air terminal is more conveniently located to the downtown area than any air terminal in the United States. The Municipal Airport is served by eight scheduled air passenger lines.

As planes land in Kansas City, the scenery that rolls by below bespeaks the economy and tradition of the Midwest. The Livestock Exchange Building and the Kansas City Stockyards occupy an area of 238 acres. Here buyers and sellers can be seen in action every forenoon, and here, too, on the eighth floor, the editorial forces of VETERINARY MEDICINE publish that independent professional journal.

With an airport only five minutes from downtown, Kansas City, indeed, has a unique position on the nation's travel map.
Courtesy TWA

Here each month are published ideas, suggestions and comments picked up by VM reporters at veterinary meetings.

The Meeting Circuit

Diagnostic Problem

Dr. John Turlington of Melfa, Virginia owns a valuable yearling harness horse which presents a knotty diagnostic problem. Your comments and suggestions are requested. The dam of this animal had little milk and it was taught to eat and drink at an early age.

It is impossible to give him much water since it produces diarrhea. There seems to be no way of satisfying the animal's thirst. His appetite is good and he feels well at all times. This animal has had "the book" of vitamins all his life, but never eats salt except when it is put on the feed.

Send your ideas to VETERINARY MEDICINE, 803 Livestock Exchange Bldg., Kansas City 2, Missouri.

Regulation of Estrus and Ovulation

Control of estrus and ovulation in the bovine has long been a research challenge of vital interest to practitioners and livestock owners. Recent developments in this field reported by William Hansel at the New York State Conference suggest that a breakthrough may be in the offing.

These Cornell studies show that seven daily injections of oxytocin (100 I.U. subcutaneously plus 50 I.U. intravenously) beginning on the day of estrus cause heifers to return to estrus at the ninth or tenth day. Ovulation occurs normally and subsequent cycles are of a normal length. The oxytocin injections suppress the formation and function of the *corpus luteum*. In effect, ocytocin injections cause heifers to have shortened estrus cycles in which the *corpora lutea* are non-functional. Oxytocin was not previously known to have any effect on the estrus cycle.

It has also been found that heifers given oxytocin and progesterone concurrently do not come in heat until four days after progesterone is withdrawn. These findings make it possible to produce estrus and ovulation in a given heifer at practically any predetermined time but problems remain to be solved before practical application of this knowledge can be made. Attempts are being made to reduce the number of oxytocin injections necessary and develop a long-acting oxytocin preparation. All of the studies to date have been with non-lactating cows and heifers.

Anaplasmosis a Virus Disease

Research conducted at Louisiana State University indicates that anaplasmosis is a virus disease. The so-called anaplasma bodies are in reality inclusion bodies in the red blood cells. Virus particles can be photographed in the same red blood cells. The anemia does not result from red cell destruction as previously supposed. The causative virus attacks the hemopoietic system interfering with the formation of new red blood cells. Thus, as the old cells die

off, a new supply is unavailable and the animal becomes progressively anemic. Experimental and clinical data indicate that when anaplasmosis is diagnosed in a herd the treatment of all animals not showing symptoms with an arsenical or iron preparation will aid in reducing the severity of subsequent cases and reduce losses. Stimulation of the hemopoietic system is also indicated in chronic anaplasmosis.

Equine Leptospirosis

Some of the recent observations of leptospirosis have been in the equine species. It has been reported that the disease is of subclinical nature in the horse with seldom any recognizable symptoms other than those of periodic ophthalmia. Cases that resembled acute iridocyclitis, with lacrimation and photophobia, have been positive to the serum agglutination test but only in titers. Three cases have been diagnosed clinically as acute leptospirosis and were positive to the serum agglutination test. Two died and one recovered. There was some question as to the cause of death in one case. A complicating factor was a severe catarrhal enteritis due to a saline purge given prior to the time the horse was brought to the clinic.—*E. F. Ebert, D.V.M., 11th Annual Conference for Veterinarians, College Station Texas.*

Nitrate Intoxication

Soil improvement from the use of commercial fertilizers that contain nitrogen has brought on the problem of livestock intoxication. Excessive nitrate content of feed plants is an increasingly important cause of intoxication of farm animals. Forage plants such as oats, sorghums, corn and certain weeds have been known to cause losses of cattle because of the nitrate concentration during adverse growing conditions.

Recently, the combination of fertilization and drought has caused poisoning by plants usually considered safe. Cattle and sheep grazed in drought strickened corn fields suffered heavy losses. Alfalfa, clover, sorghums and such common weeds as pig weed, lambs quarter, smart weed and Jimson weed have been found to contain enough nitrate to poison animals which graze on them or eat them as forage.

In speaking of symptoms, the accidental acute cases where livestock consume large fatal amounts of fertilizers are not referred to. Rather the more chronic form due to consuming forage containing an excess of 1.5 to .2% nitrate content is discussed. Symptoms vary from those of indigestion and loss of milk production to chronic diarrhea, loss of weight and chronic parasitism. Normal appearing cows may abort. Cows and feeder steers may have a history of digestive upsets and laminitis. There may be impaired reproduction and evidence of vitamin A deficiency. Fresh blood is a chocolate brown color and remains the same when exposed to air due to the methemoglobinemia. This is different from prussic acid blood which is the same color but rapidly changes to a bright cherry red when exposed to air. Nitrate field testing tablets enable the testing of feeds in a few minutes and roughly estimating whether or not they are toxic.

If the nitrate eaten is not of too great an amount, many cattle will respond to quiet handling plus methylene blue one to four per cent in a 5% solution of dextrose administered intravenously.

Addition of carbohydrates and vitamin A help to reduce the toxicity of feed if the total nitrate is not over 1.5%.—*E. F. Ebert, D.V.M., 11th Annual Conference for Veterinarians, College Station, Texas.*

Rhinitis in Dutch Hogs

An outbreak of atrophic rhinitis among Dutch hogs has necessitated the mandatory killing of over 15,000 hogs in the province of Limburg. This respiratory disease is new to the Netherlands, and the government is taking severe measures to wipe it out, according to the United States Foreign Agricultural Service.—*National Hog Farmer, February 1959.*

Autogenous Wart Vaccine

While commercial vaccines are available for treatment of animals infected by wart virus, *Molitor bovis*, the effectiveness may not be as rapid as an autogenous vaccine prepared from the infected animal. This was most apparent in the following case of wart infection of a horse referred by Dr. O. D. Foss, Christine, North Dakota. There was no response to commercial vaccine.

Following treatment with an autogenous vaccine, consisting of four weekly intramuscular injections of 5 cc each, the warts had completely disappeared.

The vaccine was prepared by removing approximately 10 gm. of warts from the muzzle of the infected horse and adding them to 100 cc. of physiological saline. The warts were then homogenized in a tissue grinder and the virus killed by adding 0.3% formalin. The resulting 1:10 suspension of wart material was tested and found bacteria free and used as the vaccine.

Similar therapeutic results have been obtained from three cases of warts on cows using individual autogenous vaccines of this type.—*Frank Noice, Ph.D. and D. F. Eveleth, Ph.D., D.V.M., Dept. of Vet. Science, N. Dak. Agricultural College, Fargo. Published with approval of the Director.*

Fig. 1. Extent of warts infection prior to vaccine injections.

Fig. 2. Appearance of horse 30 days after first injection.

Parasitic Bronchitis

The question is sometimes posed as to what is known of the technic of vaccination of calves against parasitic bronchitis.

In Britain where, in some damp areas, parasitic bronchitis due to *Dictyocaulus viviparus* is particularly severe, field experiments have been carried out using a vaccine prepared from the larvae of *D. viviparus* which have been subjected to *x*-radiation. Some 15 bull calves were given a dose of 1,000 attenuated larvae which did not migrate to the lungs and set up bronchitis. They were capable, however, of producing considerable resistance in the host to a natural infection. Vaccinated animals, when killed 80 days after vaccination and 30 days after a challenge dose of 4,000 normal larvae, showed a dramatic reduction in the worm burden from an average of 1,000 worms per animal to about ten. Out of 15 vaccinated calves, three died, but in the control group subjected to the same pasturage conditions ten out of 12 died showing typical lesions of parasitic bronchitis.—*The Pennant, October 1958.*

Milking Machine Recommendations

The recent work of California investigators has clearly demonstrated the importance of proper milking machine function in the prevention of mastitis. The common occurrence of faulty machine operation found in

these studies suggests that veterinarians must be increasingly aware of this factor. The following guide from *Veterinary Science News* offers some indication of how various makes of equipment should be operated. The critical strain gauge studies of Schalm *et al.* (April VETERINARY MEDICINE) are required for accurate determination of milking machine function.

TABLE 1. Manufacturer's Recommendations for Various Milking Machines

	Kind Vacuum* on Line (inches)	Pulsations per Minute
Anderson	13½	46 to 50
Chore Boy	10	70 to 75
Conde—old pulsator	11-13 (10 inflations)	58 to 60
Model "M"	13-15 (13 inflations)	64 to 66
Conde—new pulsator	10-12 (10 inflations)	56 to 60
Conde	12-14 (13 inflations)	60 to 64
Conde "400"	8	56
DeLaval Magnetic	15	48 to 50**
DeLaval Sterling	15	48 to 50
DeLaval Magnetic (new model)	12½-13	45 to 48**
DeLaval Sterling (new model)	12½-13	45 to 48
Empire—old model	15-16	48 to 60
Empire—new model	13	44 to 48
Hinman	10-10½	65 to 70
Marlow	10	120
McCormick-Deering, old model	14-15***	48 to 52
McCormick-Deering, new model	12-14	48 to 52
Perfection—old model	13	48 to 60
Perfection—new model	13	45 to 50
Rite-way (long tube)	15	38 to 40
Rite-way (short tube)	15	48 to 60
Sears Farm Master	13	45 to 50
Surge with heavy check valve in head	15	48 to 60
Surge with (removable) light check valve in head	13	48 to 60
Universal—long tube	10-11	58 to 60
Universal—short tube	10-11	58 to 60

*Flow of vacuum may be retarded if line is plugged with dirt, grease or dried milk deposits. Clean vacuum line with a hot lye solution (one 13 ounce can in 5 gallons water) at regular intervals.
**The number of pulsations per minute can be changed only by a service man. All other machines have pulsators which can be adjusted by the operator.
***Inches Optional.

Corners to Stay Out Of

Our friend, Doctor Goofer, has violated another rule in working with livestock. In this instance, he picked up a piglet without first making sure the sow couldn't help with the examination. Any female animal will rush to the defense of her young.

This is the second of a series of safety reminders compiled by Dr. A. A. Case, University of Missouri, from actual practice accidents. When a veterinarian is injured, the practice is injured. Don't let it happen to you.

A summary of various research developments and clinical experiments on the nature and control of bloat is presented by the writer. This report was delivered at the Midwest Veterinary Nutrition Conference, Kansas City, Missouri, December 8-9, 1958.

Controlling Bloat in Cattle and Sheep

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MANY METHODS FOR CONTROLLING OR PREVENTING BLOAT in cattle and sheep grazing legume pasture have been proposed. Very few of these methods have any value or at least any practical value in the prevention of bloat. The economic importance of bloat in this and other countries has stimulated much research on bloat control in recent years. Along with this have come a number of suggestions and exploitations that can hardly be classified as research.

Kinds of Bloat

There are several kinds of bloat which may or may not be related to each other. These include: (1) legume bloat; (2) feed lot bloat; (3) toxic bloat (HCN, NH_3, etc.); (4) pathological bloat (abcesses, adhesions, etc.); and (5) obstruction of the esophagus.

This report will be confined to legume bloat. The other kinds of bloat will be mentioned but briefly. Legume bloat is frequently spoken of as frothy and non-frothy, but the author has observed only the "frothy type" on legume pasture. Feedlot bloat is also said to occur as the frothy or non-frothy type. Legume bloat and feedlot bloat both appear to be controlled by certain antibiotics and oils. It appears that sublethal amounts of cyanide may cause bloat, and yet it is generally agreed that cyanide is not the cause of legume bloat.[1] Bloat due to cyanide most frequently occurs in cattle grazing frosted sorghum and Johnson grass.

Bloat has been classified according to type by Cole *et al.*[1] as chronic, subacute and acute. Chronic bloat corresponds to "pathological bloat." Subacute bloat, by definition, is the kind of bloat occurring on legume pasture. Acute bloat is the term usually reserved for animals that die or must receive treatment to prevent death.

Theories dealing with the cause of bloat have been reviewed by Cole *et al.*,[1] Dougherty,[2] Johns,[3] and Parham *et al.*[4] Most authorities agree that bloat is probably caused by two or more factors. Factors responsible for rapid gas formation and frothy ingesta cannot be overlooked as major ones in the cause of bloat.

Experimental Bloat

Barrentine *et al.*[5] produced experimental bloat by grazing Ladino clover with steers for 90 minute periods morning and afternoon. Between grazing periods the steers are held in drylot with shade and water

but no feed. Johns[3] employed much the same procedure except that the forage was cut and fed. Lindahl *et al.*[6] used the morning and afternoon feeding to produce feedlot bloat. The experimental production of bloat has made it possible to study methods of controlling bloat.

Controlling Bloat?

Do not graze legumes while wet with dew or rain. This is probably one of the most common beliefs about bloat control and yet the author has never seen any experimental work to support this idea. In fact, the reverse is more nearly true as most cases of critical bloat occur on clear warm days.

Graze the cattle on the legume for short periods until they have become accustomed to the change. This method has no merit as it is essentially the way we produce bloat. The author has never observed a case of legume bloat the first day an animal was grazed on legumes. Johns *et al.*[7] made the same observation in New Zealand. If cattle bloat the first time they are grazed on a forage, some form of toxic bloat should be considered.

Feeding detergents to cattle before or while grazing legumes. Nichols[7] postulated that detergents, such as many household products contain, might prevent bloat. Barrentine *et al.*[9] reported that as much as 30 gm. of the pure detergent (Ultrasvet K) was ineffective in preventing bloat.

Fertilizing the legume with high levels of phosphorus or feeding phosphorus compounds to cattle while grazing legumes. Cooper and Woodle[10] have postulated that bloat can be reduced by fertilizing the legume generously with phosphate fertilizers or feeding phosphate compounds. No experimental support for this idea has been found. There is more evidence to suggest that high levels of phosphate fertilizer aggravate a bloat situation.

Feeding hay before pasturing. It requires about 17 lb. of Sudan hay per animal per day to prevent bloat in animals grazing legume pasture.[1] Lesser amounts of hay may reduce but will not eliminate bloat. From a practical point of view, this would have to be considered an unsatisfactory method of controlling bloat.

Alternate grazing of grass and legume pasture. This method has been shown to reduce the incidence of bloat where the grass was Sudan.[1] Sod-seeding of ryegrass in clover will reduce the incidence of bloat. However, the objection to either method of control is that a bloat situation has to be anticipated and plans made to provide the grass pasture or sod-seeding ryegrass.

Do not pasture legumes until they are in the bloom stage. The incidence of bloat in most upright legumes such as crimson, red, and Bur clover and alfalfa decreases as they reach the bloom stage, Barrentine *et al.*[11] Even though sound, this practice usually has little practical value to most farmers.

Soilage, or cutting the legume and feeding. Less bloat will occur if alfalfa is cut and fed than if the alfalfa is grazed.[1] This is due to the fact that when the alfalfa is cut and fed the animals are forced to eat the entire plant rather than selectively graze the tops. However, this procedure is more applicable to systems of production rather than a means of bloat control.

Strip grazing, or restricting the animals to a small amount of new forage each day. This procedure reduces the incidence of bloat on alfalfa and other tall legumes but is of little value with white clover. In this system the animals are forced to eat the entire plant as in soilage. It requires extensive management and is not popular in this country.

Feeding or dosing with silicones. Barrentine *et al.*[9] reported that 20 gm. of pure methyl silicone given each time before grazing will prevent bloat. Dosing in the morning does not protect the steer from bloat in the afternoon. Due to the high cost of methyl silicone and the management required, this method is impractical. Commercial products containing methyl silicone were ineffective in preventing bloat even when fed at five times the recommended amount. Johns[3] reported that silicones were effective in controlling bloat; however, the silicones used were dissolved in paraffin and Johns[12] now concludes that silicones are ineffective in preventing bloat.

Feeding or drenching the animals with oils or spraying the legume forage with oils. Reid and Johns[13] and Johns[12] report effective control of bloat with a variety of oils

such as vegetable oils, emulsified tallow, cream and paraffin oils. Protection lasted for only a short time following oil treatment, and animals had to be treated twice daily to prevent bloat. Spraying the legume and then "strip grazing" the sprayed portion was also effective. Although effective, this method of bloat control is not likely to be used extensively because of the management and labor required.

Oral administration of antibiotics. Much work has been done on the use of antibiotics since the original report of Barrentine *et al.*[14] In this report it was found that penicillin in doses of 50 to 75 mg. would protect steers from bloat for one to three days. Terramycin (Pfizer) administered along with other antibiotics was reported ineffective. Terramycin has been reevaluated and found to give some protection against bloat. However, penicillin is still considered more effective than Terramycin in preventing bloat.[15]

Bloat Prevention

A number of antibiotics have been tried for bloat prevention and the only one that has been found equal to penicillin is erythromycin (Ilotycin — Eli Lilly). However, no commercial application of this has been made due to the higher cost of erythromycin. Properly prepared penicillin salt mixtures, offered free choice to cattle grazing legumes, has been shown to give good protection from bloat.[16]

The observation that small doses of penicillin control bloat has been studied extensively in this country and in New Zealand and almost without exception the report has been confirmed. However, after continuous administration of penicillin for about two weeks a kind of resistance develops in some animals, and they start bloating again. Johnson *et al.*[17] reported that penicillin became ineffective in controlling bloat after about 12 days. However, we have obtained good protection from bloat after 28 days of feeding a penicillin-salt mixture and after 20 days of oral administration of 100 mg. of penicillin daily by capsule.

A penicillin-salt mixture, containing about 50 mg. of penicillin per ounce, was given to nine steers for 28 days. The incidence of bloat was reduced by about 60% in the group throughout the 28 day period. The incidence of bloat varied throughout the period. Bloat control was excellent in the early part of the trial. The highest number of bloat cases occured on the 16th day and then decreased again. Bloat control was as good on the 28th day as it had been at any time. After penicillin-salt feeding was stopped there was a rapid increase in incidence and severity of bloat.

Ten selected steers which were bloating well on Ladino clover were each given 100 mg. of penicillin daily by capsule for 20 days. The steers were grazed morning and afternoon, and therefore, each steer could bloat twice each day. The steers were rated as follows according to the occurence and severity of bloat:

Rating	Description
0	Not Bloated
1	Slightly Bloated
2	Moderately Bloated
3	Severely Bloated

The day before treatment was started, the ten steers had a total bloat rating of 41. The highest rating that could have been given these ten steers would have been 60. Bloat control was excellent, but never perfect, throughout the 20 day period. The combined bloat rating was four on the first day following treatment and two on the second day. The highest rating of 10 occured on the 13th day. The combined bloat rating was four on the 20th day, and this came from one steer which bloated moderately morning and afternoon. Bloat occurrence and severity increased rapidly after the penicillin dosing was stopped. On the third day seven out of the ten steers bloated with a combined rating of 24.

Penicillin continues to give some steers good protection from bloat for periods as long as 28 days or longer. However, some steers develop some kind of resistance and will bloat after about two weeks even though penicillin is continued. Many of these steers are still receiving some protection from bloat because if penicillin is discontinued the severity of bloat increases. Johns[18] has verified this observation.

Cause of Death of Bloated Animals

There is as much disagreement among research workers as to the cause of death as there is about the cause of bloat. Cole *et al.*[1] have reviewed the leading theories as to the cause of death in bloated animals. Death from bloat follows an unpredictable pattern which is not easy to explain. We have observed that young steers during their first year are much more likely to die than are steers which survive the first year and are carried over to the second year. However, this is not a matter of age as older animals certainly die from bloat. We have observed many animals that bloated over a hundred times and then died of bloat. One steer died the 5th time it bloated. This is the least number of cases of bloat we have observed before death occurred.

Is it possible that the occurrence of bloat in an animal may in some way predispose this animal to death from bloat at a later date? We are inclined to think so, and the reason for this seems to be lung damage. Necropsy of a number of steers that died of bloat revealed lung damage to be the only consistent abnormal finding. In every case, the lungs of steers that died of bloat were congested. Hemorrhage in the alveoli was common and some steers had blood in the trachea. Portions of the lungs of all steers revealed a condition that was tentatively called pneumonia. It appears that a steer with normal lungs can withstand the pressure occurring in legume bloat, but if the lungs are impaired it may die. The immediate cause of death appears to be asphyxia, probably because of reduced functional lung surface. The cause of the lung damage is probably unrelated to previous bloat in some cases, but in most cases it is felt that the lung damage is the direct result of previous bloat. Plans are under way to study the pathology involved in the lung damage observed.

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Vascular Study of a Giraffe

The age-old puzzle of how a giraffe can supply blood uphill through eight to ten feet of neck has been answered in part by Dr. Robert H. Goetz, Albert Einstein College of Medicine, New York.

The giraffe has high blood pressure, thus bridging the gap between the heart and brain. In an animal 13 feet tall, it ranges from 282/158 to 353/300, rising as much as 100 mm. when the animal struggles.

When the giraffe lowers its head, a "wonder net" — the *rete mirabile caroticum* — interrupts the flow of blood through the carotid artery, breaks it into a meshwork of small streams which lower the pressure, then empties it into the main cerebral artery.

In spite of lifelong hypertension, none of the animals studied showed arteriosclerotic changes. All blood vessels were "perfectly normal."

A new approach to therapy based on control of edema with a diuretic drug is presented in this report. Clinical and experimental evidence offers promise for more successful treatment of edema disease of swine.

Edema Disease in Swine

Clinical Evaluation of Acetazolamide Sodium

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EDEMA DISEASE IN SWINE, which was of minor importance only ten years ago, has become a disease of increasing economic importance.

The condition was described by Shanks in 1938 as occurring in the swine raising areas of northern Ireland, although it actually had been observed in this area since 1932.[4,10,17,18] Edema disease was first reported in the United States in 1947 and since that time the disease has been more widely recognized. This condition has not been reported in animals other than swine.[4]

Some investigators have reported that the disease is caused by a beta hemolytic strain of *Escherichia coli*. Symptoms and lesions of edema disease originally were reproduced by the intravenous injection of supernatant fluid taken from the intestinal content of pigs with edema disease. Later the disease was reproduced by the intravenous injection of a culture of beta hemolytic *E. coli*.[9,10,11,12,13,16,18,19] Consequently, it has been suggested by some investigators that the disease may be associated with the action of a toxic factor produced by the organism.[5,6,7,8,9,14,16]

The disease may appear suddenly in a herd and outbreaks frequently occur soon after a change of feed or management. This disease occurs during the ages when pigs are usually vaccinated (six to 14 weeks of age). The duration of the disease is two to 14 days, and herd morbidity may vary between 4% and 40%. Mortalities in affected animals may be as high as 90%.[4,14] Losses usually are confined to the first four or five days after the appearance of the disease.

The symptoms reported[8,10,13,14,17,18] are anorexia, severe dyspnea, edema of the eyelids and mandibular region, redness of the ears and nose, and a nervous staggering gait

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due to muscular incoordination. Pigs in the advanced stages of the disease frequently become prostrate, paddle continuously, suffer convulsions or develop paralysis. Since the symptoms are similar to those of hog cholera, the two diseases may be easily confused.

On postmortem examination the edematous area may be confined entirely to the greater curvature of the stomach. A most common finding is edema in the stomach wall between the muscular coat and mucous membrane of the stomach wall. Edema also may be found in organs such as the gall bladder and urinary bladder. Excessive amounts of peritoneal, pleural and pericardial fluids may be present. However, edematous lesions eventually disappear and may not be observed in pigs that have been dead for several hours. Pathological changes of the central nervous system have not been reported in pigs affected with the nervous disturbances.[10,14]

Numerous drugs including streptomycin, sulfamethazine-sulfamerazine, penicillin, B vitamins, magnesium sulfate and recently steroids have been recommended for the treatment of edema disease. Few of these treatments were effective for animals in the advanced stages of the disease.[1,8,20]

One of the recent advances made in the therapy of edematous conditions in humans was the discovery and development of acetazolamide. This compound is beneficial in reducing the edema associated with cardiac dysfunction, certain types of obesity, toxemia of pregnancy and other conditions. This compound inhibits the action of the enzyme, carbonic anhydrase, and the significant physiological effect is diuresis. The mechanism of action is that of blocking the formation of H_2CO_3 in the renal tubules, keeping the blood electrolyte change to a minimum. Thus, excessive fluids which are retained in the blood stream, tissues or body cavities are excreted by the kidney. Since abnormal retention of fluids is one of the characteristics of swine edema disease, a field evaluation of the compound, sodium acetazolamide (2-acetylamino 1, 3, 4-thiadiazole-5 sulfonamide sodium) Vetamox (American Cyanamid) was initiated.

Materials and Methods

Acetazolamide sodium, a soluble preparation for feed or water medication and a parenteral preparation were distributed to practicing veterinarians for their evaluation. The parenteral solution was formulated so that each milliliter would contain 100 mg. of acetazolamide sodium. Herds of pigs were chosen for treatment where the outbreaks of swine edema disease were occurring. The suggested dosage for initial investigation was 2 to 5 mg. acetazolamide sodium per pound of body weight. Clinical reports on each herd in which the drug was used as the only treatment were submitted by veterinarians from Iowa, Missouri, and Nebraska.

Results and Discussion

The results of the treatment of 144 pigs in herds in various stages of edema disease, with the respective dosages and routes of administration, are summarized in table 1. A recovery of 125 pigs (86.8%) was re-

TABLE 1. Results of Different Routes of Administration of Acetazolamide Sodium For Treatment of Swine Edema Disease

Route of Administration	Mg./lb.Bd.Wt.	Clinical Stage	No. of Pigs	Recoveries No. (%)	Mortalities No. (%)
I.M.*	2	advanced	18	14(77.8)	4(22.2)
I.M.	2	mild to advanced	40	31(77.5)	9(22.5)
I.M.	5	advanced	5	4(80.0)	1(20.0)
I M.	4	advanced	1	1(100.0)	0(0.0)
I.M.	4	mild to advanced	17	16(94.4)	1(5.6)
I.M.	12.5	advanced	1	1(100.0)	0(0.0)
Oral** (drinking water)	2	mild to advanced	62	58(93.7)	4(6.3)
Total Treated			144	125(86.8)	19(13.2)

*Intramuscular — one or two doses only.
**Duration of treatment five days.

Edema of eyelids and snout in experimental *E. coli* toxemia.

ported by the investigators.

Twenty-five of the pigs were in the advanced stage and not expected to live. Of this total, 20 (80.0%) recovered. Improvement was evident within 16 hours and recovery in 24 to 60 hours. A dose of 2 mg. acetazolamide sodium per pound of body weight was administered intramuscularly to 18 of these pigs. In another case one pig received 4 mg. acetazolamide sodium per pound of body weight. The administration of 12.5 mg. acetazolamide sodium per pound of body weight was given to one other pig. The remaining five pigs received 5 mg. per pound of body weight. The five mortalities were the four pigs receiving 2 mg. acetazolamide sodium per pound of body weight and one pig which received 5 mg. per pound of body weight (table 1).

A total of 57 other pigs was treated parenterally. Of these, 40 pigs received 2 mg. acetazolamide sodium per pound of body weight and 17 pigs were given 4 mg. acetazolamide sodium per pound of body weight. All of these pigs had symptoms of edema disease when medication was started and 47 pigs (82.5%) recovered.

Another group of 62 pigs was given 2 mg. acetazolamide sodium per pound of body weight in their drinking water for five days. These pigs also had edema disease at the start of medication and 58 (93.7%) subsequently recovered. In the diseased herds, 357 animals, not showing symptoms, were segregated and given acetazolamide sodium in the drinking water at a dosage to supply 2 mg. per pound of body weight. The duration of the treatment ranged from three to ten days, or an average of five days. No additional cases of edema disease were observed in these pigs. Although controls were lacking, it can be reasonably postulated that treatment with acetazolamide sodium prevented further cases of edema disease from developing.

The reports submitted by the investigating veterinarians indicated that treated pigs did not exhibit further signs of infection. It was the opinion that the use of acetazolamide sodium reduced the mortality which could have been as high as 90%. Furthermore, the mortality probably would have been greatly increased in animals not receiving any treatment.

Summary

Clinical reports from veterinarians who used Vetamox acetazolamide sodium for the treatment of edema disease in swine are reviewed. A summary of these reports shows recovery of 125 (86.8%) of the 144 treated pigs. This includes the recovery of 20 pigs (80.0%) of the 25 pigs in the advanced stage and not expected to live. There is reasonable evidence that acetazolamide sodium in the drinking water is helpful in preventing further cases from developing in an affected herd. No evidence of untoward effects from the treatment was observed at any time.

According to the clinical reports a daily dose of 2 to 5 mg. acetazolamide sodium per pound of body weight administered intramuscularly or in the drinking water is effective for the treatment and control of edema disease in swine.

Acknowledgment

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WHO Report on Psittacosis

Although it has been generally held that psittacosis can be contracted only through contact with infected parrots, parakeets and other psittacine birds, improved serodiagnostic technics indicate that non-psittacine birds such as turkeys, ducks, chickens, pigeons, and even gulls and sparrows, are susceptible to infection and capable of passing it on to human beings. This new light on psittacosis — or ornithosis in non-psittacine birds — is presented by Dr. K. F. Meyer in a recent World Health Organization report.

Doctor Meyer indicates that the unspectacular frequency of psittacosis recorded in the past was probably due in part to the difficulty of diagnosis. Unless direct association with a psittacine bird was evident, a case of psittacosis was quite likely to be reported as a respiratory infection of unknown origin. Improved serological technics in recent years have simplified diagnosis of the disease. Isolation of the virus, however, remains the ultimate diagnostic criterion.

"Protective Milk"

Only the newborn can effectively absorb protective antibodies into the blood stream from the intestines, according to University of Wisconsin scientists. The ability is virtually gone by the time the newborn is 48 hours old, although antibodies absorbed up to that time remain in the blood for about 15 days.

The protective milk theory is based on the fact that cattle whose udders are injected with a disease organism will produce milk which contains antibodies against that disease. (See VETERINARY MEDICINE, January 1959, page 1.)

Experiments with guinea pigs, rats, rabbits, dogs and monkeys all suggest that during the first two days of life feeding of blood serum containing disease antibodies may protect the newborn from diseases throughout the critical first months of life.

Later, antibodies that come into the body pass through the digestive tract and fail to get into the blood stream. Adults cannot protect themselves from diseases by drinking milk containing antibodies.—*What's New in Farm Science, Bull. 526.*

SMALL ANIMAL PRACTICE

NEO-POLYCIN OTIC combines a topical anesthetic with two antibiotics effective against the bacteria that commonly cause infections of the ear canal. Each gram contains dyclonine hydrochloride 1%, neomycin (present as sulfate) 2 mg., and polymyxin B sulfate 4000 units . . . in a liquid formulation of Fuzene,* which is miscible with ear wax and exudate and permits the release of high concentrations of the active ingredients. ● Fuzene provides enough viscosity to insure that the medication adheres to the inflamed external meatus, yet spreads readily throughout the affected area. ● Polymyxin is effective against most gram-negative organisms and possesses antifungal properties comparable, *in vitro*, to those of agents routinely used for the treatment of superficial fungous infections. It is also the most potent available antibiotic against *Pseudomonas aeruginosa*, a common invader in otitis externa. ● Neomycin acts against most of the bacteria that cause topical infection and is particularly useful against *proteus* and *staphylococci*. ● Dyclonine hydrochloride (Dyclone*) is a safe and potent topical anesthetic with antiseptic properties.

Neo-Polycin Otic is supplied in 8 Gram (¼-ounce) bottles.

NEO-POLYCIN* OTIC

stops pain, itching and infection in

otitis externa

PM

PITMAN-MOORE COMPANY
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*Trademark

A simple valve mechanism that has proved effective for prolonged surgery under inhalation anesthesia is described. It has only one moving part and operates by the compressed air-gravity method.

A Respiratory Valve for Thoracic Surgery

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FOR THE PAST TWO YEARS, a respiratory blow-off valve has been utilized by the Cardiovascular Experimental Surgical Laboratory of the University of California Medical Center at Los Angeles. It has proved satisfactory and has been dependable for prolonged thoracic and abdominal surgical procedures on animals.

The valve is milled from 5.0 cm. acrylic plastic stock. It functions on the principle of forced air flow going through an interrupter motor (fig. 1), which periodically obstructs the flow of air. When the air flow is not obstructed, the valve plunger rises to supply the animal subject with air (fig. 2), and vice versa it drops by gravity to let the animal exhale when the air flow is momentarily obstructed (fig. 3).

The lucite plastic valve is 13 cm. long and has an outer diameter of 5 cm. (fig. 4). The great wall thickness helps to maintain the

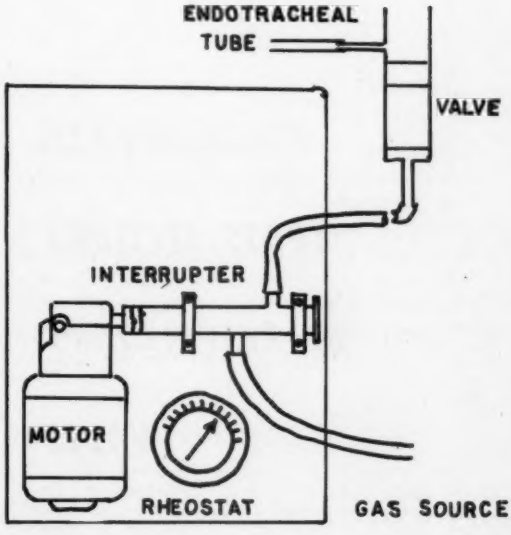

Fig. 1. Schematic representation of the rheostat, interrupter and valve as a unit.

This work was supported by grant-in-aid no. H-2812 of the United States Public Health Service.

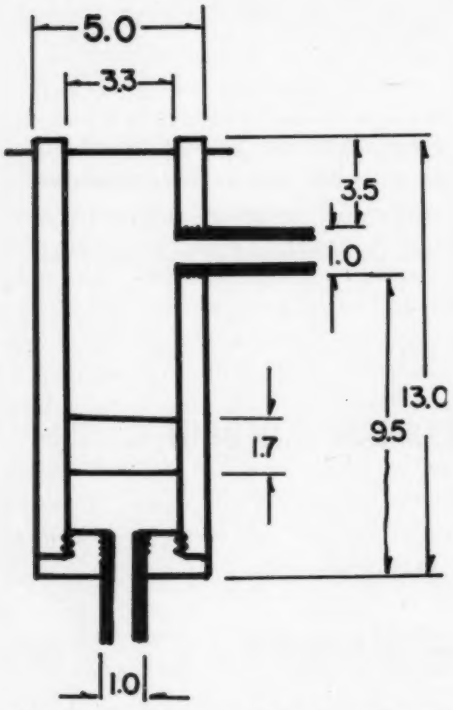

Fig. 2. Diagrammatic representation of the cross-sectional measurements of the valve. All dimensions are in centimeters.

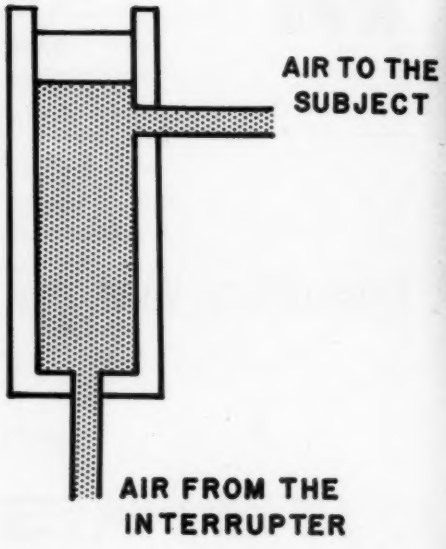

Fig. 3. Valve supplying patient with air or gas.

DIAGRAMMATIC CROSS-SECTIONS OF RESPIRATORY VALVE

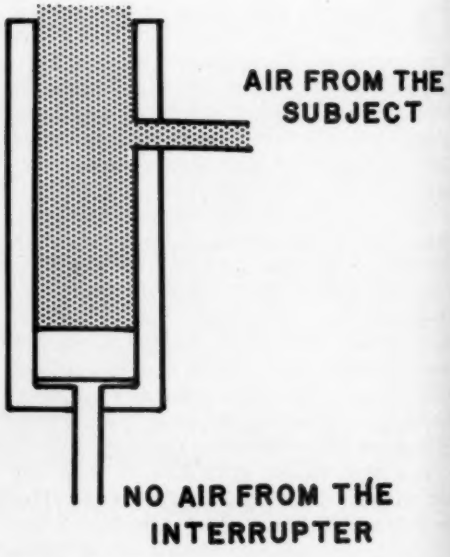

Fig. 4. Valve during the resting phase.

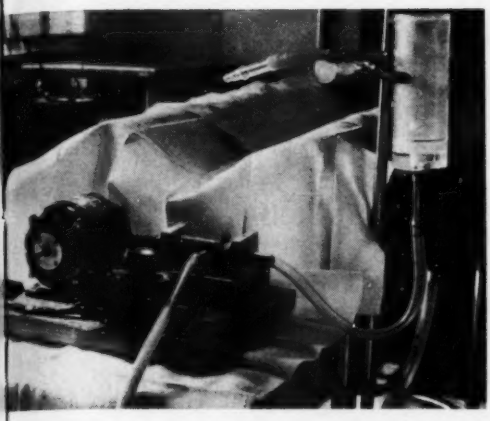

Fig. 5. Photograph of the apparatus ready for use.

valve at an even temperature preventing expansion, thus minimizing the friction variation between it and the plunger. The inside diameter is 3.3 cm. and the clearance between wall and plunger is 0.05 mm. The plunger is also made of lucite plastic, the inside of which has been drilled out and replaced with a lead plug weighing 40 gm. Thus, the plunger is sufficiently heavy to overcome the residual air remaining in the lungs and drop to its resting position by gravity.

The valve functions very well with part of the respiratory system described by Lippman, et al.,[1] which consists of the air buffer reservoir interposed between the source of the compressed air or anesthetic gas and the interrupter. The latter is driven by a small electric motor and its speed can be controlled by a variable rheostat. With each rotation, the interrupter cuts the air flow in and out. If gas anesthesia is desired, the valve can also be used with the Hunterian Laboratory Anesthesia Apparatus[2] or its modification by Lippman, et al.[1] The degree of lung inflation can be controlled either by the flow of the gas used or by the speed with which the interrupter motor rotates. These adjustments are very easily performed by the circulating member of the surgical team. Figure 5 shows the apparatus assembled for use.

Difficulties Can be Avoided

Some difficulties with the valve can be avoided if it is constructed properly and utilized in the proper sequence of the apparatus as described. One of the major difficulties in the past has been that (1) the plunger was not heavy enough, (2) the inside of the valve was not perfectly smooth, and (3) the moisture from the exhaling animal caused the valve plunger to stick. Now, however, the plunger is heavy enough to overcome friction as well as the stickiness due to moisture. The valve as constructed will not overinflate the lungs even if the plunger does not fall to its resting position, since the air will escape through the sides. The inside of the valve should not be lubricated or siliconized, since its performance will not be improved and a hazardous condition may result if the valve is used with oxygen.

Summary

A brief description is given of a simple respiratory blow-off valve for use in experimental thoracic surgery. The valve has only one moving part and operates efficiently by the compressed air-gravity method. It is suggested that it be used with a small electric motor which interrupts the flow of air rhythmically and a buffer tank interposed between the source of compressed air and the interrupter.

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Clinical Application

Subcutaneous Fluid Electrolyte Usage

SUBCUTANEOUS FLUID ELECTROLYTE USAGE in the dog is not as effective as intravenous usage. However, it is preferable in many instances because of its convenience and simplicity, especially for the small puppy or kitten. (We are not considering the subcutaneous fluid when used only as a convenient diluent.)

The electrolytes found in canine plasma are quite similar to those found in lactated Ringer's (Hartman's) solution. This multiple electrolyte usually is clinically acceptable in practically any condition where one may use subcutaneous fluid in the young animal. However, when the need for fluid electrolyte occurs, there is usually a stress situation and negative nitrogen balance, and therefore a potassium deficit which occurs with weight loss. A young animal requiring subcutaneous fluid often shows a tendency toward metabolic acidosis. This makes the use of more sodium than chloride academically acceptable. In .85 or .9 NaCl we know there is one part sodium to one part chloride; whereas in plasma and in lactated Ringer's solution the proportion is 1.4 to one. The more intensive the stress situation, the more the weight and potassium loss, and therefore the greater the need for potassium. For this reason, we now use Polysal (Cutter) or Ionosol DCM (Abbott)

# of Resuscitative Procedures

for subcutaneous usage rather than the lactated Ringer's solution. Both are similar to the lactated Ringer's solution except for twice the amount of potassium and the CO_2 factors, and a small amount of magnesium. Because of the rubber stopper, there is no wastage in the use of the plain Polysal. The stopper for the Ionosol DCM is inefficient and leaks.

Dextrose and amino acid solutions should not be injected subcutaneously or intraperitoneally. Both these solutions remain static or unused until there can be adsorption of fluid and electrolyte and proteins to the area injected. Then the injected dextrose or amino acids can be absorbed and used. This adsorption occurs whether or not the dextrose and amino acids are added to multiple electrolyte solutions. Whenever the need for fluid electrolytes is immediate and serious, this delayed action of subcutaneous or intraperitoneal usage of dextrose or amino acids may temporarily extend the already present deficits of the animal and it may not survive. Even if these procedures were sound, they would be most inefficient because often the recommended dose of dextrose and amino acids provides only two or four calories per pound per day. This is comparable to using 3 cc. of distemper serum for prophylaxis for a young 40 lb. dog subjected to distemper exposure for ten days.

Good clinical management requires that the puppy be brought on feed as soon as possible, and then usually the fluid electrolyte problem takes care of itself.

No puppy or kitten is too young for subcutaneous fluid and multiple electrolyte in correct dosage. Contraindications to the subcutaneous use of lactated Ringer's solution, or Polysal, or Ionosol DCM in the puppy or kitten are extremely rare.

In every possible instance we try to treat the animal with medical problems as an out-case, and like to send surgical cases home by the day after the surgery. In its familiar surroundings, usually, the animal is prone to take food earlier and in more desirable quantities; also early ambulation is often desirable. There is such a clinical problem as the stress of fear which adds to the catabolism of the surgical or medical problem.

Medical Usage of Subcutaneous Fluid Electrolyte

1. For any small puppy or kitten with diarrhea, high temperature, anorexia or vomiting, the dosage is usually 10 cc. per pound, although it may be increased up to

15 cc. per pound. Usually one injection will give the puppy or kitten the boost it needs. The one-pound Toy or very small puppy can be given fluid subcutaneously, the same as an older or larger animal. For the very small animal, dosage measurement of antibiotics can be facilitated by the use of a tuberculin syringe.

2. Eclampsia. Besides regular calcium gluconate injected intravenously, one may add 3 cc. per pound of body weight of 1.5% calcium in the Polysal. In this case, Polysal is only a diluent for slower absorption of the calcium via the subcutaneous route.

3. Calcium gluconate (1.5%) diluted in fluid electrolyte may be used in every case of over-breathing and elevated temperature which needs treatment. This subcutaneous use of calcium simplifies and makes the clinical handling of this part of the problem better than the use of only intravenous calcium gluconate. The calcium need in heat stroke and over-breathing is a clinically distinct hypocalcemia or tetany.

4. Subcutaneous fluid electrolyte may be used in any puppy or kitten sick from being wormed. Here again, added calcium gluconate is an excellent clinical routine.

5. Any young animal that needs a blood transfusion also needs fluid and electrolytes. Their use makes the transfusion more efficient. In severe hookworm disease, for instance, the blood transfusion is given intravenously, which allows for its immediate use, together with an injection of 10 cc. per pound of body weight of Polysal, given subcutaneously. In the extreme situation, this routine may be repeated in four hours.

6. Frequently in Boston Terriers, at about the 58th day of term, there is evidence of impending labor. This occasionally is a sub-clinical hypocalcemia. We use 3 cc. of 1.5% calcium gluconate in the Polysal, given subcutaneously.

Surgical Usage of Subcutaneous Fluid Electrolytes

This has rare usage except occasionally in surgery in the very small animal.

1. On rare occasions, in anesthesia in the Toy or very small animal one may find a slight resuscitative need for subcutaneous fluid electrolyte. Usual dosage is 6 to 10 cc. per pound of plain Polysal.

2. For routine pre-operative cesarean section usage, one may give the dog 3 cc. of 1.5% calcium gluconate per pound of body weight. This is only for slow absorption of the calcium. Many of these animals have a sub-clinical hypocalcemia.

Combined Medical-Surgical Usage of Subcutaneous Fluid

It is quite rare that we find a combined medical-surgical usage of subcutaneous fluid electrolytes. However, on that infrequent occasion, elevated temperature and over-breathing may occur in the early stages of anesthetic recovery. Here again, subcutaneous fluid electrolyte is used only as a diluent of the calcium which is recommended (as stated previously) when over-breathing and elevated temperature occur.

PART II

Intravenous Fluid Electrolyte Usage

THE MOST IMPORTANT OF ALL CLINICAL EVALUATIONS for the need of fluid is the application of the clinician's art, which is the skill gained from experienced observation. Dr. Charles Mayo once said, "Judgment is an asset that makes both a clinician and surgeon a superman."

The water requirements per pound daily of the canine are extremely variable. They vary from the normal adult animal under no stress or exercise who needs little (approximately 20 cc. per pound daily), to the old pyometritis animal with a low fixed specific gravity of the urine and the added water need because of the stress and catabolism of the infection. The owner usually says, "She drinks water all the time." I have known my bird dogs to drink 10 cc. of water per pound of body weight per hour when working on a hot day.

In the over-all clinical aspects of most

medical problems, using intravenous fluid electrolytes is usually not an efficient procedure for the ambulatory dog. In ambulatory medical situations when there is need of water and electrolytes, we like to give the animal, orally, eight to 12 times daily a mixture of table sugar, dry skimmed milk, a vitamin, and a multiple electrolyte (Lytren—Mead Johnson). About 95% of the time, the animal will then drink the water it requires, which is one of the most important factors covering the clinical aspects of water-electrolyte usage. (See later under oral electrolytes.)

Today, for most intravenous situations we use practically the same formula as described at the Minneapolis A.A.H.A. in 1954. This is 5% dextrose in Ionosol DCM (Abbott), or Polysal (Cutter) — with additives — per liter of 20 cc. of 10% calcium gluconate, 1,000 mg. of ascorbic acid, 10 cc. of 5X SoluB (Upjohn), and 500,000 units of penicillin.

Medical Usage of Intravenous Fluid Electrolytes and Additives

1. In any medical problem of dehydration, it is advisable to use 15 to 20 cc. per pound of the fluid electrolyte combination for the beginning of the therapy. There may be situations such as: (1) extensive vomiting or diarrhea for any reason; (2) no fluid intake whatever for 24 or more hours.

When severe leptospirosis is presented, there is usually a history of extensive vomiting. Dehydration and an elevated B.U.N. are always present. The vomiting points to a possible metabolic alkalosis in which case the above fluid combination usage would be incorrect. However, clinical usage and examination of Na, Ka, Ca, CO_2 and Cl indicate that apparently the metabolic acidosis caused by the infection of leptospirosis overshadows the possible metabolic alkalosis from vomiting. I find that the fluid combination may be used with beginning therapy in leptospirosis.

2. Heatstroke is rare in my practice, but this fluid combination is effective in heatstroke, and the usual dosage is 15 to 20 cc. per pound of body weight, as mentioned previously. The animal also needs calcium in addition to the calcium present in the solution. The additional calcium should be given intravenously as for eclampsia at the start of the intravenous fluid, and also calcium gluconate 1% solution subcutaneously in the dosage of about 4 cc. per pound. In the early phase of extreme high temperature and over-breathing, there is a need for oxygen, which can be made available to the animal by holding a tube to the mouth. (An oxygen chamber cannot be used in the early stage of severe heatstroke, with the over-breathing and slight calcium tetany, because of the help needed to administer the intravenous fluid and the injection of the 1% calcium gluconate subcutaneously. By the time one has finished the intravenous routine — all the while oxygen is being made available by a rubber tube — the critical stage of the over-breathing, anoxia and high temperature has passed.)

3. Strange as it seems academically, the clinical problem of dehydration in the year-old animal convalescing from what appears to be "slow" distemper is often a chronic dehydration problem. Such a chronically dehydrated animal may have slow specific gravity of the urine, and, of course, a need for much water. Dehydration in an animal whose kidney function permits concentration of the urine to at least 1,035 presents a different problem from the dehydration of the animal whose kidney dysfunction temporarily or permanently shows a specific gravity of the urine to be 1,010. In this later involved problem, there is an accompanying and often severe anemia. The anemia sometimes parallels the specific gravity of the urine. In other words, the clinician may find the anemia refractory to treatment as long as the low specific gravity of the urine persists. I have found intravenous fluid electrolyte of little value in this chronic dehydration problem. There is more to the dehydration problem than water and salts.

4. In the very early stage of dehydration of an animal previously in excellent condition, there is a slight loss of weight, and some increase in hemoglobin level. This, of course, can be best evaluated if one knows the accurate normal hemoglobin, or hematocrit and weight, for the

animal. In the early stage of dehydration of the animal in excellent condition, no loss of elasticity of the skin is apparent, and in exceptional situations the animal may show a hematocrit of 65 or a hemoglobin of 22 gm. and no discoloration of the sclera. This is to say, there are no signs of early dehydration in the very healthy animal, but dehydration is readily discernable with the hematocrit determination. (We are not here considering the dehydrated and uremic animal.)

5. There are literally scores of important facets in the clinical problem of snake bite poison. This fluid combination used intravenously, 15 to 20 cc. per pound of body weight, has clinically a very acceptable place in the early part of any serious snake bite poison problem of the dog. The extreme snake bite poison condition is also a shock problem. Besides early treatment it also needs suction (incision or excision of the bite area), antivenom, antibiotics, and blood transfusion. Sedation is contraindicated. In snake bite, when the condition is severe enough to cause extreme swelling of any part, there is an early increase in the hematocrit, caused by proportionately more serum than red blood cells leaving the circulatory tree. Here is where the intravenous combination is clinically acceptable. Also a blood transfusion is often indicated on a high and rising hematocrit or hemoglobin. (The last severe snake bite poison case I treated was presented four hours after the accident. The hematocrit was 67. Both fluid-electrolyte and blood infusion was started immediately. Before recovery, there was extensive swelling which extended from all of the head, the front legs and to the xiphoid cartilage.)

6. A new clinical condition is found when an animal eats tranquilizer pills. The animal needs to be given fluid parenterally until it can be given oral force-feeding nutrients. In a recent case, I used the electrolyte dextrose-additives combination the first day, and 5% dextrose the second day. Incidentally, the few of these animals I have seen show an accelerated ESR. From laboratory and clinical observation, I have thought the catabolism in one instance was equal to what would be expected in two severe fractures.

Surgical Usage of Intravenous Fluid Electrolyte and Additives

This is the same fluid combination as mentioned just previously for intravenous medical situations.

Among the many axioms of the famed late Dr. John Elliott of Miami are two that are appropriate here:

1. "Shock treatment is prevention."
2. "There is hardly any limit to the extent of a successful surgical problem as long as one can maintain the circulation."

This fluid combination usage is an aid in shock prevention in canine surgical problems.

Nearly all surgical cases that need intravenous resuscitation in my practice need this routine only once. For my surgical usage, this fluid combination is used 25 times more often than blood infusion.

The quicker a dog can move about and eat after surgery, the more satisfactory the result of the surgical problem. (I know of no situation in which post-surgical sedation helps the dog.)

The multiple electrolyte-dextrose-additives solution has very rare surgical contraindications in the dog and the usual dosage is 10 to 15 cc. per pound of body weight. This fluid usage can well be the first remedy in any needed resuscitation, because of anesthesia, operative procedure, or both. We are not here considering blood loss or low hemoglobin situations where whole blood transfusion is of first order. As stated before, the dog differs from man in that the dog can handle multiple electrolytes at the time of stress and anesthesia.

A dog with a thoracotomy was maintained five hours using oxygen via an automatic Burns valve. It was given 20 cc. of the fluid-electrolyte combination per pound of body weight. The Hct, ESR, and blood Na, K, and Cl were the same before and after the procedure.

When this fluid combination is given intravenously during or right after surgery, the formation of urine and the filling of the bladder are positive resuscitative signs. This is to say, we want the surgical case to have early urine formation and pass urine spontaneously.

Any experienced small animal surgeon will have no set rule for anything. For instance, in a resuscitative need during surgery, we might use the intravenous fluid electrolyte combination early; however, if at any time shock appears in reality or as a probability, then oxygen would be made available and a blood transfusion readied for the animal.

Overdosage

"It may be said that in most instances the alleged 'toxic effects' of or 'sensitivity' to the barbiturates are simply a relative overdosage with consequent respiratory and circulatory depression resulting in hypoxia. If one produces overdosage with ether, the situation can be easily reversed by artificial ventilation, provided the emergency is recognized in sufficient time."[1]

The intravenous fluid combination routine can be used in nearly all extensive surgical procedures.

1. Many fixation fracture repair and trauma situations.
2. Pyometra.
3. Panhysterectomy on fat animals, usually in estrus, that takes extra time for surgery.
4. Perineal hernia.
5. Cystic calculi.
6. Enterotomy, etc.

Combined Medical-Surgical Usage of Intravenous Fluid Electrolyte

Many surgical problems in the convalescent period are distinctly medical problems. The animal with severe trauma or extensive surgery has many needs, including fluid-electrolytes. The electrolyte need is very real, but the oral routine of administration is most efficient for the well-being of the animal, after the acute stage of resuscitation is past and the animal is ambulatory. The whole problem at this stage is often a resuscitative problem, and actually the resuscitative problem becomes a nutritive problem.

Practically, the oral routine of administration of fluid-electrolytes, as well as carbohydrates and proteins, is at least ten-fold more efficient than the parenteral routine. This is simply giving the oral feeding in the cup of the lip.

It is an extremely rare surgical case that is not ambulatory the day following the surgery. Here is the place for oral electrolytes, sugar and protein supplement. Roughly approximated, this routine is, as stated, ten-fold more efficient than the parenteral fluid electrolytes-amino acid usage in the animal. The time-saving factor is more than twenty-fold.

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Bilirubin in the Urine

From 10 to 20% of normal dogs and about 5% of normal cats have bilirubin in their urine. Therefore, the presence of urinary bilirubin is not necessarily indicative of a pathological condition. This positive reaction for bilirubin in the urine of normal dogs and cats is due to the fact that in these animals the renal threshold for bilirubin is low and the normal kidney excretes bilirubin with great ease. A simple, accurate and sensitive test for bilirubin is Ictotest.—*Atlas Newsletter, Small Animal Digest.*

Dogs on Other Planets

Dr. Melvin Calvin, Professor of Chemistry at the University of California, indicates that animals quite similar to dogs and others on the earth probably exist on millions of other planets in the known universe. At least 100,000,000 "carbon" planets started with chemical conditions not unlike those on primordial earth, and therefore should have the same pattern of cell life with properties of plants and animals, he suggests.

CLINICAL REPORT—Control of Demodectic Mange

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THE purpose of this investigation was to find a desirable concentration and method of application for Trolene (O,O-dimethyl 0-2,4,5—trichlorophenyl phosphorothioate) [Dow Chemical], a new systemic insecticide, to control *Demodex canis* infection, particularly when it was advanced and apparently hopeless. Conflicting experiences reported by others and the results of early experiments conducted by the authors, indicate that this chemical agent may not always have been applied to maximum advantage. Hymas[1] reported improvement in a few animals with demodicidosis when Trolene was applied topically in low concentration to the skin. McGregor[2] also claimed successful results in both limited and advanced canine demodicidosis when Trolene was used topically in 50% concentration. Gaafar and McDonald[3] and Sanger[4] had similar favorable results when using Trolene. Koutz[5] in a comparative test of various possible control agents for canine demodex infections, found that the dogs improved during treatment with Trolene but some relapsed within six months. Enzie[6] and co-workers have obtained striking clinical cures of generalized demodectic mange as a result of Trolene therapy; however, several "cured" dogs suffered relapses after three or four months.

Materials and Methods

Seven affected dogs, six months to 2½ years of age, were received for experimental treatment during 1958. None of the dogs received was undernourished or neglected. Four of the dogs were referred cases that had been exposed to various treatments and considered incurable when received.

Skin scrapings were made initially to confirm the presence of Demodex parasites. During treatment, the dogs were housed

indoors, except for short exercise periods. Before treatment was started, each dog was bathed with an antiseptic, detergent cleansing agent and weights recorded.

Trolene was applied in three different ways:

1. Two dogs received a topical treatment of 50% concentration Trolene emulsion diluted with an equivalent amount of glycerine, applied by swab to approximately one-third of the skin surface each day for three days. A rest of four days for observation was allowed, after which similar successive cycles of topical treatment were made. Each cycle was dictated by the degree of apparent improvement in the skin condition.

2. Three dogs were given internal medication once at the beginning of the treatment. This internal medication consisted of a capsule containing crystalline Trolene, given *per os*, at the rate of 110 mg./kg. body weight. Accompanying internal medication, topical treatment was applied in successive cycles, as described above.

3. As an improvement in method, two dogs were given internal medication, as above, at the beginning of each cycle of topical treatment.

One of the dogs had an extensive subcutaneous collateral staphylococcus infection which was treated with a parenteral penicillin/streptomycin preparation prior to Trolene treatment. Skin scrapings were examined for mites at the conclusion of treatment in each case.

Observations and Discussions

Case 1. A Beagle bitch, 2½ years of age, with a long standing skin infection was admitted for treatment. Slow spreading lesions of the dry squamous type covered the jowls, chin and chest. A few pustules were noted and the skin was thickened, reddened and denuded of hair over the lesions. The condition had been treated unsuccessfully.

The Trolene emulsion previously mentioned was applied topically for two full cycles. At the conclusion of treatment the dog was discharged and a quantity of emulsion was dispensed to the owner for local spot treatment of one or two active lesions that remained. These lesions healed shortly after discharge and no relapse had occurred in seven months after the dog was sent home.

Case 2. A Dachshund, 15 months of age, was referred to the clinic for treatment. The dog had extensive and typical squamous and pustular lesions of demodectic infection on the head and neck. Topical treatment with Trolene emulsion was pursued. At the end of one cycle of treatment the lesions appeared to be granulating and arrested in their spread, but affected skin remained inflamed and swollen. Evidence of cerebral derangement was noted during this examination. Two days later the dog was comatose. The old lesions in the skin were prominent and many new ones became apparent over the body. The possibility of toxic reaction to the treatment was discounted when a diagnosis of distemper was confirmed. The dog was destroyed *in extremis*.

Case 3. A Springer spaniel puppy, approximately six months of age and weighing 35 lb., was presented for treatment. Previous medication had failed to check an advanced form of demodicidosis involving the whole body.

Topical treatment was initiated and a single dose of granular Trolene given *per os* during the first cycle of topical treatment. Four successive cycles of skin treatment were necessary to relieve the disease. The pup was released at the end of the treatment period with all but a small active lesion on the jowl healed. Emulsion was dispensed for spot treatment by the owner. Inquiry revealed that the active chin lesion disappeared quickly and that the dog's condition has been normal since release.

Case 4. A 29 lb., nine months old smooth-coated Terrier, with large discrete denuded patches over the whole body, was presented for treatment. The skin was dry, wrinkled and semi-desquamated over the lesions. A few pustules were present and some lesions had reddened borders. Previous medication did not check the spread of this condition.

One dose of crystalline Trolene was administered at the beginning of topical treatment and four successive cycles of treatment were administered over a 36-day period. While there was measurable improvement

in the disease, response to medication was not rapid. When the dog was released several small active lesions remained. The condition improved at home but continued medication was necessary. This dog had diarrhea during treatment and became thin and depressed at times. Whether these disease signs were due to medication or some concurrent disease was not ascertained.

Case 5. A 20 lb. Dachshund, one year of age, and suffering from a rapidly fulminating case of demodectic mange, was presented for treatment. The condition had been treated previously but did not respond. Extensive lesions involved the skin of the head and chest. The skin was quite inflamed and the hair sparse in the affected areas.

One dose of granular Trolene was given and one course of topical treatment applied. Within a week the animal was released, since lesions had faded and swelling disappeared, with the hair growing back. Affected skin healed without need for further treatment. No relapse had occurred in the five months post treatment.

Case 6. A 85 lb. female Great Dane, one year of age, was referred to the clinic by a practitioner because of an intractable demodicidosis. The feet were swollen, with pus oozing through fissures in the skin. Pustules occurred in patches over the body. The concurrent staphylococcus infection complicating the demodicidosis was resolved successfully and quickly by the antibiotic therapy described previously.

Three successive cycles of topical medication were given over 25 days. At the beginning of each cycle of skin treatment a capsule of granulated Trolene was administered *per os.*

The dog had an active lesion on one paw when released. The hair had almost grown over the previously denuded lesions and the pus condition had cleared. Emulsion was given to the owner for spot application to the active lesion. The dog has been normal for over four months.

Case 7. An 18 lb. long haired female mongrel dog was received suffering from advanced pustular demodectic infection. Because the dog was a ward of the clinic it was kept as an untreated control for the other cases of experimental treatment.

At first the dog improved without treatment. The hair began to grow on the back and sides and body lesions began to fade. However, new lesions occurred on the forelegs and medial sides of the hind limbs. Approximately 2½ months after being admitted, a relapse occurred, lesions reappeared over the body surface and the hair fell out over large areas of the body.

The dog was retained as a control until the last clinical case was discharged, then, because the disease was very advanced and the dog becoming emaciated and depressed, internal and topical treatment was administered. An internal dose of Trolene was administered at the beginning of each of the four successive topical treatments. Hair coat had improved markedly and persistent lesions on the forelegs were healing well 33 days after the beginning of treatment. The physical and mental well-being of the dog improved markedly. Resolution of this case of demodicidosis is too recent to know if relapse will occur.

Treatment

All but one dog responded to the various types of treatment. An extensive exfoliation of skin was noted after the first course of topical medication in all dogs. The underlying skin became soft and free of the scale that had marked areas devoid of hair. Evidence of rubeosis of affected skin areas and *Urticaria oedematosa* gradually diminished. Lesions were arrested and the skin took on a melanotic pigmentation prior to the regrowth of the hair coat in denuded areas. No two dogs responded to treatment in the same way. Lesions persisted in some dogs for a longer time than in others. Because of the slower response to therapy, additional cycles of medication were needed in some cases. Prior antibiotic therapy was advantageous in dealing with an outstanding concurrent staphylococcus infection; the swollen purulent condition in the skin resolved quickly, making possible effective local treatment for mites. When Trolene was given internally at the beginning of each course of topical treatment, the re-

Continued on page 312

CLINICAL REPORT

Management of an Unusual Canine Anemia

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A one year old female Toy French Poodle, weighing five pounds was presented at the clinic on May 4, 1958. The patient had been vaccinated for distemper and hepatitis, and had previously been checked for internal parasites. The present owner had acquired the patient two weeks previously, and since then had noticed a lack of appetite and periodic scratching over the entire body. Fecal examination revealed heavy infection with *Trichuris vulpis*. A dry, scaly haircoat was noted on physical examination as well as a chronic ocular discharge, and heavy accumulation of hair in the ears. Body temperature was normal. Heart and lungs were examined and found to be normal. Inactivated distemper-hepatitis vaccine was given as a booster.

On May 5, 1958 the patient was fasted and wormed in the morning with Phthalofyne (Pitman-Moore). Medrol (Upjohn), a steroid, was dispensed and given in an attempt to control the dermatitis and self inflicted trauma resulting from scratching. A selenium sulfide shampoo was given, and linoleic-linolenic acid perles were dispensed in an attempt to correct the dry haircoat.

The patient was not seen again until May 15, 1958 when the client complained of his pet's listlessness, depressed condition, and complete lack of appetite. The body temperature was 101.8 F., and other physical findings were the same as previously noted. Blood examination was as follows: WBC, 22,850; RBC, 3,370,000; Hb, 9 gm.; diff: lymph, 8; seg., 48; non-seg., 26; mono., 18; nucleated RBC, 10.

The patient was put on Tetracycline (Pfizer), 100 mg. t.i.d.; injections of B_1, B_6, B_{12} (500 micrograms), and iron-dextran. Medrol, 1 microgram b.i.d., was continued.

The patient was returned to the clinic on May 19, 1958. The owner described collapsing seizures suffered by the patient whenever the least bit excited. On physical examination enlargement of the heart was apparent. Body temperature was normal, and blood examination revealed the following: WBC, 19,550; RBC, 2,690,000; Hb, 7.5 gm.; diff: lymph, 28; seg., 20; non-seg., 34; mono., 18; nucleated, RBC 6; rubriblasts, 2. Clotting time was 45 seconds.

Tetracycline, 100 mg. t.i.d., and Medrol, 1 microgram, b.i.d. was continued, and 50 cc. blood was administered intravenously.

On May 20, 1958 the patient was again presented. No improvement was evident at this time. It was decided to initiate the use of the antibiotic (Spontin—Abbott). The following treatment was instituted and repeated on May 21 and May 22: 100 mg. Spontin dissolved in 100 cc. of 5% dextrose and saline fortified with 250 mg. ascorbic acid and B-complex, was administered intravenously and followed by 50 cc. whole blood. Tetracycline was continued at 100 mg. t.i.d. and 1 mg. Medrol b.i.d. The only side effects noted were vomiting attacks about one hour after the initial administration of Spontin. This was controlled successfully by an intramuscular injection of methyl atropine, 1 mg. There was a tremendous improvement by the second day of therapy, and by May 22 the patient wanted

food, and heart sounds were normal. The blood count of May 22, 1958 was as follows: WBC, 8,850; RBC, 4,950,000 Hb, 13.5 gm.

The patient was returned again on May 26, 1958. No symptomatology was noted. Another blood specimen was taken, with the following results: WBC, 7,900; RBC, 4,140,000; Hb, 13.5 gm.; diff: lymph, 26; seg., 52; non-seg., 16; mono., 6.

This patient was on the verge of collapse at one point during therapy. Upon the institution of Spontin therapy, recovery was nothing short of miraculous. This antibiotic has been referred to as "the last ditch antibiotic." It is gaining rapid recognition for its effectiveness in resistant staphylococcal infections.

CONTROL OF DEMODECTIC MANGE

Continued from page 310

sponse seemed better than when a single internal dose was given.

Mites were found in three dogs after treatment; in three other dogs no mites were found. It was not ascertained whether the mites isolated after treatment were alive or not, although they were not degenerate in appearance.

When indicated concentrations were used, no dog exhibited ostensible signs of toxic effect from Trolene.

Summary

Three methods of applying an organophosphatic systemic insecticide (Trolene) to dogs in the successful control of canine demodectic mange infections are described.

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The Opossum

That strange marsupial, the opossum, the only mammal native to North America which carries its young in a pouch, is discussed by Edmond J. Farris, of the Wistar Institute of Anatomy and Biology, in a standard work on laboratory animal management.

The gestation period in the opossum is 12 to 13 days. The young are very immature at birth, weighing only approximately 1.3 grains. A dozen can be held in a soup spoon with room to spare. The female opossum has two uteri in which the embryos lie free; there being no placenta. Litters range in number up to 16. The young are about one-half inch long at birth and the hind limbs are so undeveloped as to be only flippers; yet grasping the moist hair with the well developed front feet, the young when born wriggle along the abdomen, enter the pouch and attach to the ovoid plug-like teats. They remain in the pouch for 60 to 70 days. For a time after they emerge the dam transports them on her back with their tails wrapped around her tail and their feet firmly clutching the thick fur on her back.

There are four genera and four species of opossum in North America: (1) *Didelphis virginiana,* the Virginia opossum, is plentiful throughout nearly the whole of the United States. (2) *Metachirops fuscogriseus,* the gray mask or four-eyed opossum, which is about the size of a rat. (3) *Metachirus nudicaudatus dentaneus,* the wooly opossum weighing rather less than a pound when full grown and (4) *Marmosa isthmica,* the murine opossum, which is about the size of a mouse.

It is valuable in embryology studies.

Here each month are published ideas, suggestions and comments picked up by VM reporters at veterinary meetings.

Small Animal Clinic

Rapid Electrolyte Determinations

A Rochester Bedside Laboratory Kit is being used experimentally in small animal surgery and medicine at Iowa State College. This kit is used to determine the sodium, bicarbonate, chloride, total base and blood urea levels of serum. The main purpose of this work is to determine what type of fluid therapy is needed in treatment of nephritis. The blood urea nitrogen section of the kit is being compared with the LaMotte test to see how the two compare in accuracy.

Although no conclusive results have been obtained on the types of fluids to use in nephritis, the Rochester Kit appears to be a fast and efficient way of determining electrolyte levels, and should be of help to veterinarians in fluid therapy problems.

Diagnosis of Canine Strongyloidiasis

The incidence of canine strongyloidiasis in America is unknown. There is little data available for attempting an estimate of the frequency of occurrence since too few veterinarians are diagnosing the condition or reporting it when they find the larvae. However, those veterinarians who have mastered the procedures for floating the larvae find them with sufficient frequency to be convinced that this parasite is widespread and is in all probability being overlooked.

Having worked with the parasite over a period of more than 29 months and having explored the use of several flotation medias, Iowa State College clinicians have come to the conclusion that sugar solution with a specific gravity of 1.265 gives the best results, (1 lb. of sugar, 12 oz. of water, 4 cc. of liquid phenol).

Gastro-enteritis of Pet Birds

Gastro-intestinal problems of pet birds are usually accompanied by the following signs: fluffing feathers, sleeping, perching on both legs constantly, anorexia, refusing to leave cage or talk. Cachexia is observed in cases of long standing. Specific symptoms encountered are caking or occlusion of rectum, voluminous intake of grit, copious water intake, soft or watery stools green in color and containing large amounts of water.

Noninfectious causes may be poor seed mixture, inferior seeds, spoiled greens, poor or inadequate grit, lack of fresh water, patient eating from human diet and not receiving proper nutirition, birds taken from parents before they are able to husk seeds for themselves, or excitement from excessive handling or strange environment.

Infectious causes are salmonella, Pasteurella, psittacosis and coccidiosis. It is wise to treat all cases on an infectious basis. Treatment consists of one teaspoon of chloromycetin palmitate (Parke-Davis) mixed with one teaspoon of Biosol Powder (Upjohn) and one teaspoon of V-Pektamalt (Warren-Teed). Two drops of this mixture are administered initially and followed by one drop every four hours. An alternative

for the client that cannot handle the bird would be to use sulfamethazine solution with one teaspoon of Biosol powder in the liquid for four days. Another possible addition could be one crushed Lactinex tablet (Hynson-Wescott-Dunning) over the feed daily for seven days.—*R. M. Stone, D.V.M., Michigan State University Veterinary Conference.*

Canine Dentistry

Canine patients that require dentistry are usually quite old or poor anesthetic risks, according to a report by Persson in the May 1958 issue of *Canadian Journal of Comparative Medicine and Veterinary Science.* Administration of atropine 15 to 20 minutes before an anesthetic aids greatly in respiration and maintaining a dry mouth. Pentothal is the anesthetic of choice. An assistant should be on hand to keep the animal sufficiently anesthetized. An endotracheal tube may be passed to insure clear air passage.

Instruments required are: mouth gag, scaler, tooth forceps, elevators and a small hack-saw.

Extraction of a canine tooth involves separating the gum from the base of the tooth and careful elevation of the tooth. This is accomplished by inserting the elevator at the buccal surface and with a sideways motion following the root to near its extremity. The operator next should proceed to the lingual, anterior and posterior surfaces, using a point of leverage on the anterior surface to loosen them. If the tooth remains solid, the operator should leave it and allow pressure to build up as a result of hemorrhage to facilitate removal.

After elevation has been accomplished, the tooth should be grasped at the base with the forceps. Leverage should be applied backwards and downwards to prevent splitting and breaking of the crown at the base.

Removal of the fourth premolar presents a problem. This tooth should be removed in two sections. First the gums should be anesthetized. Locating the bifurcation of the roots, sawing through the bifurcation and elevating each part and removing complete the technic. The first lower molar is removed in the same manner.

Scaling is started with forceps to crack the tarter. It is finished with scalers. Polishing is done with a dental drill using glycerin and pumice stone. Dental flushing may be indicated to wash away debris.

Fibromas are occasionally encountered, and in many cases are benign. Removal with a hyfrecator is indicated and if a tooth is involved, it should be removed at the same time.

Toy breeds sometimes fail to shed temporary teeth, which must be removed. Malocclusion should be corrected by filing teeth to prevent ulceration and deep penetration of the hard palate. Split teeth should be removed promptly. Removal of problem teeth is fraught with danger. It is extremely important that the patient be properly anesthetized. A close watch must be maintained for signs of respiratory collapse.

Intramedullary Pins

In most situations in which we use an intramedullary pin, we seem to get better results with a full threaded pin. All pins are buried.—*Charles E. Bild, D.V.M.*

Analysis of Urine

Whenever analysis of urine is not possible immediately upon taking of a sample, decomposition can be prevented through use of refrigeration. When refrigeration is not available for several hours, a preservative may be added.

Suitable preservatives include 1 cc. toluene per 50 cc. urine, a small crystal of thymol, or 1 drop of 40% formalin per 30 cc. urine. Specific quantities should be used since larger amounts may give false positive test results of cetrain constituents. Any of the substances named will preserve urine for several days, thus making it possible to send specimens to a laboratory.—*Atlas Newsletter, Small Animal Digest.*

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Although causes are unknown, these studies of canine mast cell tumors broaden basic knowledge in this field. The striking similarity to some cases of urticaria pigmentosa in the human patient have stimulated detailed studies of the condition.

Cutaneous Tumors

The Mast Cell and Canine Mastocytoma

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IN A PREVIOUS REPORT[1] we have discussed the importance of comparative studies; reviewed basic comparative (dog to man) anatomy, physiology and reaction patterns; and delineated several interesting dermatological entities of dogs, including mastocytoma (MCT).

The increasing awareness of the mast cell in health and disease and the ready availability of dogs with mast cell tumors has prompted the authors to study 13 cases of canine MCT and investigate comparative aspects. Nickel[2] has recently presented a comprehensive study of urticaria pigmentosa (mastocytosis, human mast cell disease). Because of the extensive bibliography included in the latter report, only salient references will be listed in the present study.

Most of the Society Transactions in the A.M.A. Archives of Dermatology contain case presentations and discussions of various facets of urticaria pigmentosa, emphasizing systemic ramifications. Since MCT of dogs has systemic potential from its onset, attention is focused on the following questions:

1. Is mast cell disease in dog and man related (aside from the obvious fact of mast cell involvement in both)?
2. If they are related, then what information can be obtained from their comparative study?

Mast Cell

Michels[3] devotes 119 pages in Downey's *Handbook of Hematology* to discussion of the mast cell. Mast cells are of histogenous origin. Their supply in a normal adult is maintained by homoplastic and heteroplastic regeneration; the former accomplished by mitotic division of pre-existing mast cells and the latter by elaboration of mast granules in various connective tissue cells (lymphocytes, plasma cells, clasmatocytes, adventitial cells, endothelial cells and possibly reticuloendothelial cells).

Michels further states that tissue mast cells occur in all areas of the mammalian

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body, although there may be quantitative differences between species. Their numbers are proportional to the amount of connective tissue present. Parenchymatous organs such as the kidneys, adrenal and liver have little connective tissue and therefore few mast cells are present. The canine liver is an exception. Nielsen and Cole[4] emphasize their frequency around small blood vessels in canine skin and liver. The amount of connective tissue, and therefore the number of mast cells, is greater in the testis, ovary, salivary glands, heart, pancreas, lymph nodes and spleen. In the tonsils, spleen and lymph nodes many mast cells are present in the capsule, adventitia of the large vessels, trabeculae and medullary strands. Not infrequently mast cells lie free in the lymph sinuses but apparently never in the efferent lymphatics. Mast cells are numerous in the serous membranes, pars nervosa of the hypophysis, various layers of the digestive and respiratory tracts and organs which have a large amount of connective tissue (tongue, lung, omentum, subcutaneous and intermuscular connective tissue, etc). Mast cells are fairly abundant in the normal bone marrow of mammals. Cartilage and bone (except for the periosteum and perichrondrium) are the only tissues devoid of mast cells.

Lever[3] states that in man the relatively few mast cells in the normal skin are spindle-shaped and grouped around blood vessels and hair follicles, and in the papillary layer of the dermis. Johnson,[6] however, writes that "the normal skin has somewhere between 2,000 and 7,500 mast cells per cubic millimeter depending on the area from which it is taken." In the normal skin of the dog mast cells are abundant, particularly around small blood vessels. Their cell outline is pleomorphic (fusiform, spherical, and stellate), the nucleus round or ovoid (never lobulated) and the cytoplasm abundant and filled with coarse granules denoting maturity. The same cell morphology pertains in those conditions in the canine in which there is benign proliferation of mast cells (dermatitis, etc.).

There is evidence in both species that the mast cell cytoplasm contains histamine, heparin and hyaluronic acid in its metachromatic granules. Despite the heparin

Fig. 1. Histological section of skin. Typical mast cell as seen in normal canine skin; there are increased numbers in dermatitis. Toluidine blue; x 720.

content macroscopic hemorrhage concomitant with MCT is rare, although Larson[7] reports severe post-excision hemorrhage in a significant number of cases (though only a slight increase in the coagulation time).

West and Parratt[8] state that there is no parallelism between the concentration of mast cells and 5-hydroxytryptamine (sarotonin) in the skin of the guinea pig, rabbit, man, cat, mouse, hamster and dog, despite previous reports to the contrary. They further uphold that even in conditions of mast cell proliferation (MCT of dogs, and urticaria pigmentosa of man) there is no appreciable increase in skin 5-hydroxytryptamine.

The tendency for mast cells to occur in densely packed clusters is augmented under pathological conditions. Lever states that an increased number of mast cells accompanies granulation tissue, most itching dermatoses (atopic eczema, contact dermatitis and lichen planus, etc.), neurofibromas, the stroma of cutaneous carcinoma, urticaria pigmentosa and lupus erythematosus. In the latter, the number of mast cells closely parallels the intensity of metachromatic staining. Michels states that mast cells are decreasing during acute inflammation, absent in scar tissue and markedly increased in chronic inflammation and lymph stagnation. The authors have observed an in-

creased number of mast cells in acute and chronic canine dermatitis (fig. 1).

Canine Mastocytoma

Mast cell tumors are frequent in dogs and rare in other species. Of 1,000 canine neoplasms collated by Mulligan,[9] 201 were sarcomas, 87 of which were of mast cell origin. The MCT constitutes 10 to 13.2% of all canine tumors. Bloom[10] was the first to give a detailed description of the lesions of this condition (table 1). Nielsen and Cole[4] present 100 cases (including eight necropsies) collected over an eight year period.

This condition shows a predilection for Boston Terriers (over 40% of all neoplasms in this breed), Boxers (over 30% of neoplasms) and Fox Terriers (9% of all neoplasms). The incidence of MCT increases uniformly with age, the majority of the subjects being six years or older. There is no sex predilection.

The hindquarters (particularly the thigh), scrotum and vulva are frequent sites of occurrence. Mulligan states that 40% of the tumors occur on the scrotum, abdomen, axilla and eyelid; 30% on the posterior extremities; 20% on the vulva, perineum, anterior extremities, thorax and neck; and the remainder on the ear, mammary gland, lip, penile sheath and mesenteric and mediastinal connective tissues. The present authors could find no other report of the occurrence of a primary MCT in an extracutaneous location.

Clinically a lesion may be noticed for one to two years prior to examination, then grow rapidly in a few months to significant size. The growth originates as a small dermal mass which gradually infiltrates the epidermis and the loose connective tissue of the subcutis, but has little tendency to involve the deeper fascia and muscles.[11]

In Bloom's initial report,[10] he presents three cases of solitary and two of multiple MCT. He assumes that the neoplastic cells result from a proliferation of tissue mast cells (homoplastic regeneration). In the process the cells become more uniform (oval or spherical) and acquire a large vesicular nucleus. He describes intracytoplasmic bodies which have not been mentioned in subsequent literature or observed in our own material.

Mulligan divides the MCT into mature and anaplastic varieties. In the mature type mast cells are discrete and polyhedral and their cytoplasm pale, acidophilic and sometimes vacuolated. The nuclei are round or slightly oval, centrally placed, and have a fine chromatin network bordered by a heavy perinuclear membrane. Mitotic figures are infrequent. The cells of the anaplastic type have indistinct borders and unevenly enlarged nuclei with irregular mitotic figures. Occasional multinucleated forms are observed.

Nielsen and Cole[4] state that eosinophils are common in MCT. In addition they notice binucleated and trinucleated giant cells, somewhat similar to Reed-Sternberg cells in 3% of their cases. At times the latter together with immature cells, many eosinophils, necrosis and fibrosis suggest Hodgkin's disease. Only the metachromatic stain could definitely separate these conditions. These authors further point out that there are areas of MCT which contain no stainable granules. In general mast cell hyperplasia (in dermatitis etc.) and slow growing MCT have an abundance of mature cells with coarse, deeply-stained granules in their cytoplasm. Rapidly growing tumors contain immature cells with tiny dust-like cytoplasmic granules, a few large granules or no granules.

Paff and co-authors[12] in studying the behavior of neoplastic mast cells in tissue culture, note spontaneous ameboid movements, amitotic cell division and multinucleated cells. Oliver and co-authors[13] show that the heparin content of the MCT varies with the degree of anaplasia; the mature tumor containing 50 times and the immature 1.7 times the concentration of the normal dog liver.

There are multiple opinions as to the causal nature of MCT. Hangartner[14] considers them to be infectious granulomata whereas Bloom[10] states that single tumors are benign and multiple tumors generally malignant. Nielsen[11] believes that all tumors (single or multiple) may be sarcomatous.

Involvement in the regional lymph nodes (26% in Nielsen and Cole's[4] series), spleen and liver is common in MCT. The general health of the dog usually is not affected

TABLE 1. Comparison of Salient Tissue Involvement — Autopsies

Author	Species	Clinical	Mast Cell	Skin	Lymph Node	Spleen	Liver	Bone Marrow	Lung	Other Organs
Bloom[10]	Dog 1st Report—MCT	Recurrence post-excision, intense pruritus, generalized skin tumors, peripenile lymph adenopathy	Atypical MCT, many multinucl. giant cells, occas. mitotic figures	See mast cell	Peripenile—numerous M.C. capsule, trebeculae, sinuses & interfollicular tissue; pattern obscured, sinuses lost identity	Pattern undisturbed, throughout pulp numerous M.C. in nodules, solitary M.C. diffuse, frequently invade Malpig. Corps	Generalized moderate parenchymal degeneration periportal collections of M.C.	2.2% of marrow cells are neoplastic M.C., reversal of myeloidery-throid ratio	Throughout interalveolar tissue numerous M.C. (single or grouped)	Omentum-mensentery
Ellis[19]	Man—1 yr. child 1st autopsy report—urticaria pigmentosa	Numerous nodular lesions skin and oral mucosa, hepatomegaly, wasting, G.L.T. symptoms	2 types— 1)—mature deep metachromatic granules (closely packed), 2) immature fewer more widely spaced granules, take up less dye	Proven by biopsy	Mesenteric — lymphoid cells in reticulum replaced by eosinophils & M.C.—M.C. scattered throughout capsule trebeculae. *2nd in no. of M.C.	Large no. eosinophils & many M.C. in red pulp. No M.C. in white pulp, capsule or trebeculae. *2nd in no. of M.C.	Extreme widening of portal areas by connective tissue, many MC in fibrotic areas. *M.C. most numerous of any organ	Large no. M.C. & eosinophils adjacent to endosteum	Marked intra-alveolar hemmorrhage.	Kidney, Pancreas, pituitary capsule
Loewenthal et al[20]	Man—71 yr. male	Disseminated mac.-pap.-nod. cutaneous involvement, hepatospleenomegaly, cachexia. Oral involvement	Polygonal or round with abundant cytoplasm packed with fine granules nuclei pale, round or oval (sometimes elongated or bilobed)	Dense M.C. under epidermis	Some M.C. in sinuses & around blood vessels	Great accumulation of M.C. in red pulp (discrete masses)	Large nos. M.C. in portal tracts, sinusoids distended, disorganized liver cords with destruction parenchymal cells	During life up to 30% of all W.B.-C. were M.C.	Some areas considerable infiltrate M.C. intra-alveolar septum, in connective tissue M.C. are in relation to blood vessels (except veins)	Pituitary capsule kidney, palate, aorta, pancreas, prostrate, adrenal

*M.C. stands for Mast Cell.
M.C.T. stands for Mastocytoma.

except in the terminal stages where anemia, cachexia and other signs of malignancy may be manifest.

Nielsen and Cole[4] point out that it is difficult to differentiate between hyperplasia and neoplasia since transitional forms are well known. They state that the cardinal criterion for malignancy is a growth which will kill the host by invasion or metastasis. This criterion cannot be satisfied frequently in the dog because they are commonly euthanized before reaching a terminal state. They believe that many cases of MCT possess the following features of a sarcoma:

1. Rapid infiltrating growth of immature cells.
2. Recurrence after surgical removal often associated with rapid invasion of the surrounding tissues.
3. Metastases to regional lymph nodes or internal organs.

Adrenal-Cortical Hormone Therapy

Therapy of choice for the small MCT is surgical excision. Adrenal-cortical hormones produce a marked reduction in the number of normal mast cells. Bloom,[15] utilizing this knowledge, treated a case of recurrent multiple MCT with cortisone (900 mg. over a nine day period). After three days of therapy there was a sudden reduction in the size of the lesions. Microscopic examination revealed an ample number of mast cells with cytoplasmic vacuolation and clumping of granules. By the ninth day the nodules had completely disappeared. Histopathological examination revealed almost complete absence of mast cells with those present undergoing degeneration. Six weeks later, however, a new nodule appeared at a distant site and inguinal nodes were enlarged. Pathological changes in the mast cell in Bloom's study were the same as those observed by Asboe-Hanson[16] in independent study. The benefits of cortisone therapy in MCT were not verified by Larson.[7]

Urbach and co-authors[17] used desoxycorticosterone (DOCA) in the treatment of seven patients with urticaria pigmentosa. In one, a 54 year old white woman, a decrease in whealing was noted in two to three months and a flattening of the lesions in six months. Some degree of relapse was noted three months after discontinuing therapy.

Methods and Materials

One hundred dogs with cutaneous tumors were studied over a one year period (May 1957 to May 1958). Seventy-six dogs were examined at the University of Minnesota Veterinary Clinic, and an additional 24 cases with tumor tissue, together with clinical data, were submitted by veterinarians from the surrounding area. A majority of the cases of the Veterinary Clinic were presented because of cutaneous tumor(s). The remaining cases were discovered during examination for some other condition; 13% were of mast cell origin. The other tumors will be the subject of a subsequent communication.

Physical examinations were done on all the clinic animals. A punch or excision biopsy was performed on one or more tumors in each of the dogs. Touch smears and bleeding and clotting time were determined in those cases in which MCT was suspected.

Punch Biopsy. Hair was removed with a scissors and the site anesthetized with Frigaderm—(Brachvogel-Hovey). A punch biopsy was performed in the usual manner and the tissue fixed in 10% buffered formalin for at least 24 hours. Hematoxylineosin and toluidine blue stains were performed in the usual manner on all tumors.

Excision Biopsy. This was performed under general anesthesia (pentobarbital sodium) and the tissue fixed and stained as above.

Touch Smears. A dry, clean slide was pressed gently against the fresh cut surface of the excised tumor. The slide was allowed to dry and stained with Wright's stain. Purple-red granules in cells 8-18 μ in diameter were considered diagnostic of mast cells.

The authors obtained clinical data and tissue in seven cases of urticaria pigmentosa from the Division of Dermatology for comparison with the biopsy findings and clinical data of MCT.

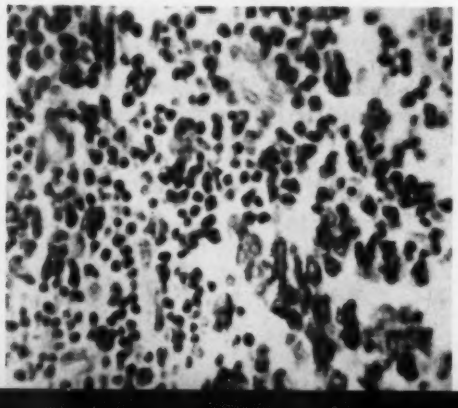
Results and Discussion

Clinical study of 13 cases involving MCT (see table 2) revealed the following:

Fig. 2. Photo of mouth showing single lesion lower lip (MCT).

Fig. 3. Photo showing multiple lesions on stifle (MCT).

Fig. 4. Histological section of popliteal lymph node (case 8) showing numerous mast cells disrupting the architecture of the node. Toluidine blue; x 75.



1. Age: 14 weeks to 14 years; average seven to nine years.

2. Breed: Boston Terriers, 4 (30%); Terriers, 3 (23%); Dachshund, 2 (15%); Boxer, Black Labrador, Chesapeake, and English Setter, 1 each.

3. Sex: 8 female (62%); and 5 male (38%).

4. Duration of lesion before being inspected by veterinarian: 1 to 19 months; average, 6.3 months.

5. Location of primary lesion: posterior extremities, 4 (30%); scapular region, 3 (23%); groin and scrotum, 2 (15%); trunk, 2 (15%); lower lip, 1 (7.7%) and forearm, 1 (7.7%).

6. Clinical features (the last three cases in table 2 were submitted without complete description and, therefore, will not be included in some of the statistics) [fig. 2, 3]: (a) surface — yellow or white; ulcerated, 3 (30%); alopecia, 4 (40%); (b) size (diameter) — 0.5 to 15 cm.; average, 4.7 cm.; form — firm, raised, papular-nodular, 4 (40%); cystic, 2 (20%); fixed to skin and free below.

7. Clinical Diagnosis: correct in 4 (30%); incorrect in 9 (70%); misdiagnosed as reticulum cell sarcoma, lipoma, fibrosarcoma, etc.

8. Number of tumors: cases (23%) with multiple tumors.

9. Physical examination-lymphadenopathy (fig. 4): 3 (23%).

10. Hematologic data (4 cases): no abnormal bleeding or clotting time found.

11. Bone survey (2 cases): Case no. 10 showed a discrete cystic area of rarefaction of the ischium.

12. Touch smears (4 cases): positive in all cases performed (fig. 5).

13. Pathology: typical in 8 (62%); atypical in 5 (38%).

14. Treatment: excision.

15. Course (complications): recurrence in 1 (7.7%); new lesions, 2 (15%); 1 case euthanized (necropsy permission denied).

Histopathologic Findings are as follows:

1. Typical (fig. 6, 7): (a) cytology — 8 to 18μ diameter; outline variable (usually polygonal), when outline distinct cells look like fragments of a mosaic; in some area cells separated by clear spaces. cytoplasm — eosinophilic (at times red-purple), some areas vacuolated; granules not seen without

special stain. nucleus — 5 to 10μ diameter, large, vesicular, basophilic, centrally located; outline variable (usually round or oval, C-shaped, reniform); occasional mitotic figures; (b) architecture — epidermis — one-third of cases ulcerated with subjacent necrosis, polymorphonuclear and fibrotic response; if intact regular acanthosis. Corium — Tumor usually fills corium; no grenz zone; tumor cells push aside connective tissue (some remaining strands surround linear arrangement of tumor cells); some areas simulate hepatic parenchyma; tumor sharply outlines appendages and blood vessels (fig. 8) but in no instance invades these structures; numerous eosinophils (fig. 9) were scattered among the tumor cells; occasional hemorrhage observed; (c) toluidine blue stain — red-purple granules vary in size and intensity of staining; usually fill cytoplasm, if diffuse obscure cell detail.

2. Atypical: (frequently diagnosed as reticulum cell lymphoma until special stains are done); (a) cytology — anisocytosis (fig. 10); cytoplasm — lesser amount, foamy appearance; nucleus — more frequent mitotic figures, multinucleated giant cells; (One case suggests Hodgkin's disease); (b) architecture — no marked difference from the typical variety; eosinophils present; (c) Toluidine blue stain — less positive, smaller granules; some areas have no granules, (fig. 11).

Comparative study of seven cases of urticaria pigmentosa in human beings revealed the following:

1. Age: 5 months to 24 years; average 4.5 years.

2. Sex: female, 5 (71%); male, 2 (29%).

3. Clinical: macule dominant lesion in 4 (57%), nodule dominant in 3 (43%) cases. There was no evidence of systemic involvement (skeletal survey done in two patients). All lesions urticated on stroking (Darier's sign). None of the dogs with MCT had a positive Darier's sign.

4. Histopathology: (a) the findings in the macular type corresponded to Lever's description (most cells spindle-shaped resembling fibroblasts); these cells were indistinguishable from normal canine mast cells as described by Bloom[10] and seen by the authors; also indistinguishable from normal mast cells associated with benign

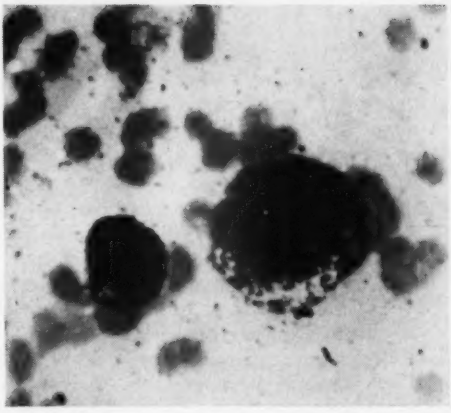


Fig. 5. Touch smear of MCT nodule. Wright's stain; x 720.

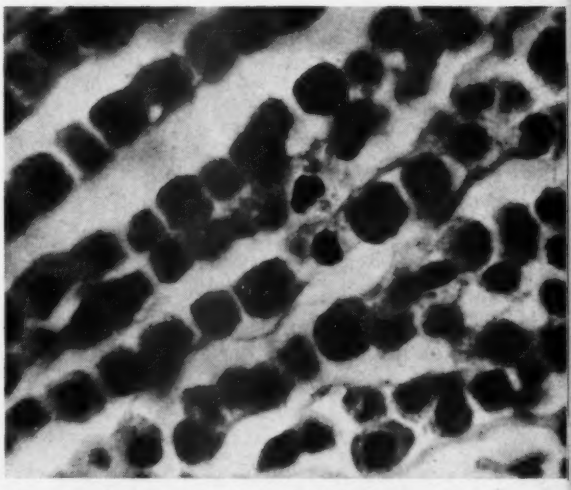
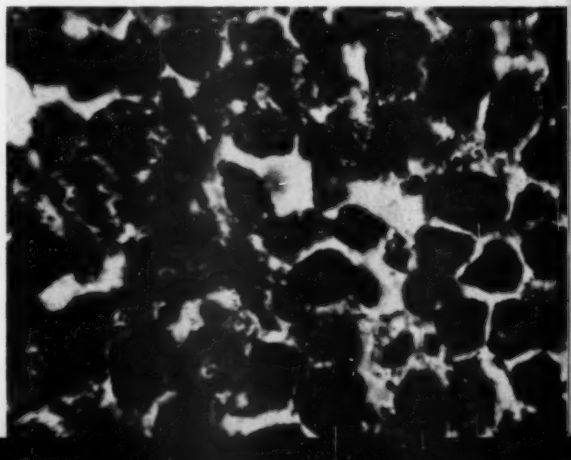


Fig. 6. Histological section showing typical MCT. Hematoxylin-eosin; x 720.

Fig. 7. Histological section showing typical MCT. Toluidine blue; x 720.



proliferation (dermatitis etc.); (b) the findings in the nodular type (fig 12) corresponded to Lever's description (tumor-like aggregates extending throughout entire dermis and subcutis, cuboidal with angular cytoplasm); cells were strikingly similar to those of typical MCT; (c) eosinophils were present in quantity in one case (nodular type); (d) most of the mast cells of the nodular and macular types stained heavily with metachromatic stains.

The statistics in our series of cases of MCT agree with those of the literature with the following exceptions: lesions were examined earlier and were smaller, there was slight female preponderance and relatively frequent scapular involvement. The series is too small for these differences to be significant.

The cases with atypical lesions (38% of the series) comprise two out of the three dogs with lymphadenopathy and all of the cases (3) with surface ulceration and multiple lesions. They also include the only case with an abnormal skeletal finding and two of the three dogs in which recurrent or new lesions developed after excision. Thus the atypical variety appears to be more malignant.

TABLE 2. 13 Cases of Mast

No.	Age	Breed	Sex	Duration	Loc.	Clinical Description	No. Tumors	Physical Exam.
1.	3½ yr.	Boston Terrier	M	1 yr.	Left scapula	White, raised ½ cm. diameter, firm, fixed to skin, free below, alopecia, surface smooth.	1	Neg.
2.	14 yr.	Boston Terrier	F	1 mo.	5th digit left leg	Yellow, 1½ cm., firm, fixed to skin, free below, 1 alopecia, ulcer anteriorly.	1	Neg.
3.	14 wk.	Dachshund	F	6 wk.	Inter. scapular	White, ½ cm. flat papule, firm, fixed to skin, free below, no alopecia.	1	Neg.
4.	8 yr.	Boston Terrier	F	—	Forearm	White, 5 cm. cystic nodular, fixed to skin, free below, no alopecia.	1	Neg.
5.	14 yr.	Terrier (mixed)	F	19 mo.	Stifle	White, largest lesion 5 cm., satellites 1½ cm., all firm, fixed to skin with ulceration, no alopecia.	7	Inguinal lymphadenopathy
6.	3½ yr.	Dachshund	F	2 mo.	Lower lip	Erythematous, 1½ cm., firm, fixed to skin, free below, no alopecia, ulcerated.	1	Submaxillary lymphadenopa
7.	11 yr.	Black Labrador (crossbreed)	M	2 mo.	Right inguinal region	Erythematous. Main lesion 15 cm., firm, nodular, free below, alopecia, ulcerated, subcut.; satellite 4 cm., lesions, abdomen.	6	Neg.
8.	13 yr.	Chesapeake	F	1 yr. Sudden enlargement 1 mo.	Popliteal region	Yellow-white, 15 cm., pedunculated cystic, fixed to skin, free below, alopecia, smooth.	1	Popliteal lymphadenopathy
9.	5 yr.	Terrier (mixed)	F	4 mo.	Scapula	Yellow-white, 5 cm. soft, fixed to skin, free below, skin smooth.	1	Neg.
10.	7 yr.	Boston Terrier	M	2-8 mo.	Thorax (largest right & left thigh	3 cm. firm; 1½ cm. firm; ½ cm. firm.	3	Neg.
11.	8 yr.	Terrier (mixed)	M	1 mo.	Scrotum	2½ cm., Spherical, firm.	1	Neg.
12.	10 yr.	English Setter	M	9 mo.	Stifle	2½ cm., firm.	1	Neg.
13.	6 yr.	Boxer	F	—	Flank	White-yellow, 4 cm., firm.	1	Neg.

Comment

The atypical case is more difficult to diagnose on histological examination. In most instances a reticulum cell lymphoma was simulated and in one, Hodgkin's disease. The diagnosis could be established only by using metachromatic stains. Nielsen and Cole[4] report that the histological appearance in some cases of MCT is similar to that of Hodgkin's disease. Reports of the pathology of Hodgkin's disease, however, are rare in the dog.[18] In the autopsy of a case of urticaria pigmentosa (table 1) Ellis[19] considered Hodgkin's disease as a possible underlying process where there were numerous eosinophils and fibrosis (but no Reed-Sternberg cells). However, he found few mast cells in ten cases of verified Hodgkin's disease.

It would not be amiss in canine or human medicine to examine metachromatic stains in cases of suspected sarcomas, unusual mesodermal tumors and in those suspected of having a lymphoma, particularly Hodgkin's disease, and the reticulum cell type. Nickel suggests that a routine stain for mast cells in the most difficult case may give more information than routine connective tissue stains especially in so called nonspecific lymphoblastoma.

Mastocytoma

No. Tumors	Physical Exam.	Hemat.	Skel. Sur.	Touch Smear	Path.	Treat.	Course
1	Neg.	—	—	—	Typical	Simple excision	No recurrence
1	Neg.	Clotting & bleeding time normal	—	Pos.	Typical (sweat glands only appendages left)	Excision of digit	No recurrence
1	Neg.	—	—	—	Typical	Simple excision	No recurrence
1	Neg.	—	—	—	Typical	Simple excision	No recurrence
7	Inguinal lymphadenopathy	C.B.C. normal, clotting & bleeding time normal	Normal	Pos.	Atypical (appearance of reticulum cell lymphoma)	Previous simple excision main lesion	Recurrence of primary lesion after 10 mo., 5 mo. later satellites appeared.
1	Submaxillary lymphadenopathy	—	—	—	Atypical (appearance of reticulum cell lymphoma)	Simple excision	No recurrence
6	Neg.	Clotting & bleeding time normal	—	Pos.	Atypical (both larger lesions diagnosed reticulum cell lymphoma)	Excision subcutaneous mass	Euthanized (resistant wound infection & eczematization, necropsy denied)
1	Popliteal lymphadenopathy	—	—	—	Typical	Simple excision (gland & primary)	3 mo. later 2 new lesions at different sites
1	Neg.	—	—	—	Atypical (appearance of reticulum cell lymphoma)	Simple excision	No recurrence
3	Neg.	Clotting & bleeding time normal	*Discrete, cystic, rare fact ischium	Pos.	Atypical (multinucl. giant cells)	Simple excision	No recurrence
1	Neg.	—	—	—	Typical	Simple excision	No recurrence
1	Neg.	—	—	—	Typical	Simple excision	No recurrence
1	Neg.	—	—	—	Typical	Simple excision	No recurrence

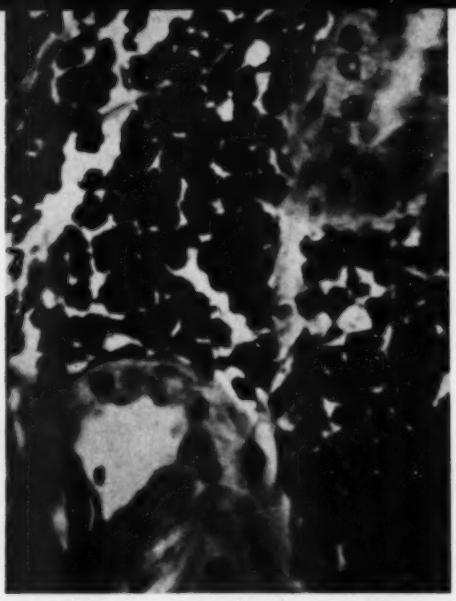


Fig. 8. Histological section showing typical MCT; tumor cells are all round appendages, but not on them. Toluidine blue; 330.

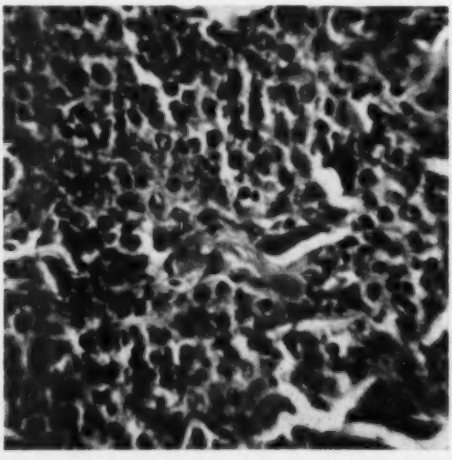


Fig. 9. Histological section showing typical MCT; with numerous eosinophils scattered among tumor cells.

The authors were unable to distinguish between the mast cell of the macular type of urticaria pigmentosa and the normal (or benign hyperplastic) canine mast cell and had difficulty distinguishing between the cell of the nodular form of urticaria pigmentosa and the typical canine MCT. This is of interest but does not necessarily imply prognostic import; since the macule may appear in the systemic variety of urticaria pigmentosa[20] and the nodule in the "benign" form. Of similar interest is the striking similarity between the three autopsy findings [10,19,21] presented in table 1. In the autopsy of the one year old child the two types of mast cells described could correspond to the typical and atypical histopathological forms of MCT. Ellis points out the close parallelism between the autopsies of the one year old girl and Bloom's dog, emphasizing the similar cutaneous, lung, bone marrow, liver and periadrenal involvement.

The cystic rarefaction of the ischium (case 10) is of great interest. Sagher and associates[22] describe two types of bone lesions associated with urticaria pigmentosa: (1) general widespread osteoporosis and osteosclorosis, and (2) similar changes confined to local sites (skull, femur, etc.). The bone changes in our case of MCT might be local. There was no other reason for bone involvement.

The production of a wheal after physical stimulation of a MCT (Darier's sign) has not been recorded. It is well accepted that release of histamine produces the wheal in cases of urticaria pigmentosa. Histamine is thought to be present in MCT. Vercauteren[23] points out that eosinophils of the horse contain a natural antihistamine which can be extracted from preparations of eosinophilic granules. He believes that eosinophils may detoxify histamine. The presence of eosinophils at the site of certain allergic reactions in both species is of interest in this regard. Riley[24] describes an influx of eosinophils in a MCT excised from a dog previously treated with compound 48/80, a histamine liberator. Drennan[25] describes a rapid influx of eosinophils into a lesion of urticaria pigmentosa stimulated by trauma, cytoplasmic vacuolization and disruption with loss of metachromasia. All cases of human urticaria pigmentosa included in this study urticated, despite the fact that one nodular lesion had a large number of eosinophils. Further study is necessary to test the thesis that eosinophils inhibit Darier's sign.

It is not clear whether human "malignant" urticaria pigmentosa or the canine MCT represent a sarcoma, systemic hyperplasia, reticuloendotheliosis, or systemic inflammatory process. The finding of the mast cell in lymph nodes, spleen, liver, bone

marrow, etc. does not necessarily imply metastases in either species; since, as Michel has pointed out, mast cells are normally present in these areas; therefore, autochthenous development cannot be ruled out.

Summary

A review of some facets of the mast cell and the canine MCT is compared with 13 cases by the writers.

Atypical histopathology in a MCT (canine mastocytoma) implies a more malignant potential than the variety with typical histopathology.

Touch smears are useful in making a rapid diagnosis of canine MCT. This procedure would likely be a valuable adjunct in the diagnosis of human urticaria pigmentosa (particularly the nodular or tumor types).

The cystic rarefaction of the ischium observed in one of our canine cases coincides closely to some reported cases of bone involvement in urticaria pigmentosa.

The failure of canine MCT to wheal on physical trauma may be a function of the large number of eosinophils present (antihistamine content).

It is suggested that metachromatic stains be performed in canine and human sarcomas, unusual mesodermal tumors and lesions suspected of being a lymphoma (particularly Hodgkin's disease and the reticulum cell type).

The cause of canine MCT and systemic urticaria pigmentosa is not known. The presence of mast cells in the viscera may not be evidence of metastasis but may reflect an overgrowth of mast cells present normally.

Since there is a striking similarity between the canine mastocytoma and some cases of urticaria pigmentosa, canine MCT is suitable for experimentation in relation to human urticaria pigmentosa.

Acknowledgments

We wish to express our gratitude to Dr. Francis W. Lynch for his guidance and advice, and to Dr. Robert W. Goltz for considerable assistance in interpreting the histopathologic sections.

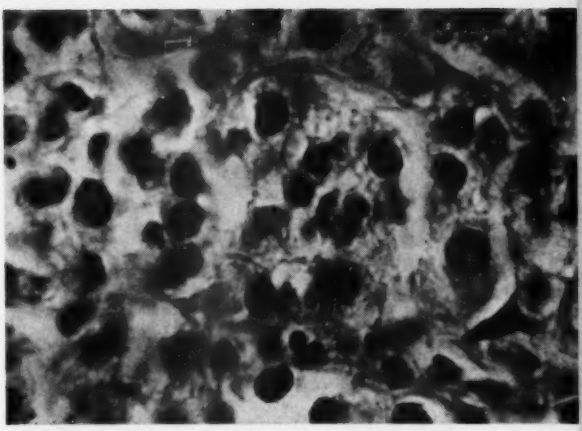


Fig. 10. Histological section showing atypical MCT. Malignant appearance of the cells together with polymorphism suggests a lymphoma (Hodgkin's disease, etc.). Hematoxylin-eosin; x 720.

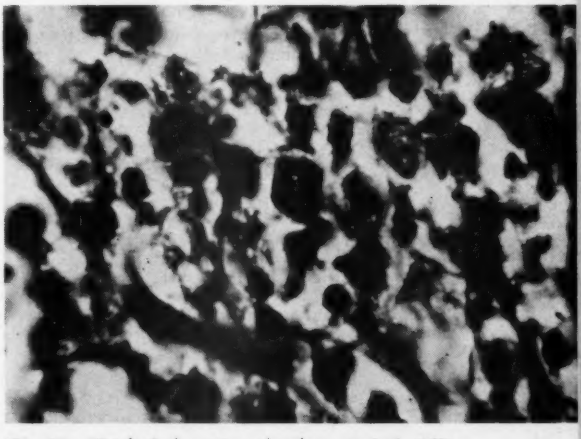
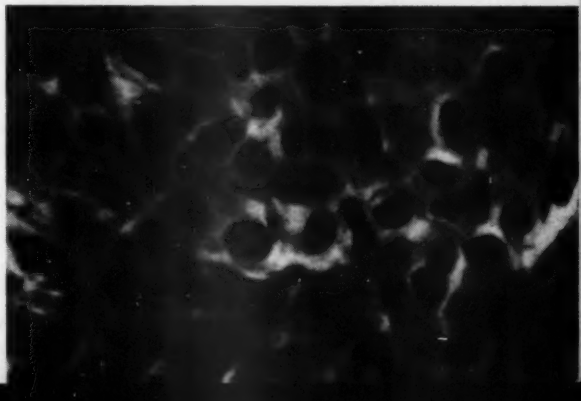


Fig. 11. Histological section showing atypical MCT. Some areas of cells have a paucity of granules. Toluidine blue; x 720.

Fig. 12. Histological section from a nodule from a human case of urticaria pigmentosa. Notice the similarity of cells to those of typical MCT. Hematoxylin-eosin; x 720.



Addendum: Since the submission of this manuscript, Head (Cutaneous Mast-Cell Tumors in the Dog, Cat and Ox. Brit. Jour., *70:389, 1958) has published a review of mastocytoma in the dog, cat and ox based on the study of 166 animals. He reported eight cases of canine mastocytoma in which only internal organs were affected, and offered a tentative classification of animal mastocytoma. Gorlin, Clark, and Chaudhry (The Oral Pathology of Domesticated Animals. Oral Surg.,* Oral Med. and Oral Path., *11:500, 1958) have reported one case of canine mastocytoma originating on the hard palate and cited Riser (Treatment of Tumors in the Dog: Comparison of Surgery and Physiology, Proc., 91st. Annual Meeting, Am. Vet. Med. Assn., p. 279, 1954) as having observed three cases in the nose and mouth.*

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Sixty Colleges Share Grant

Chas. Pfizer and the Pfizer Foundation have announced that grants for scientific research, medical education, health and welfare during 1958 amounted to approximately $1.4 million.

More than 60 colleges and universities shared the grants which were made for advanced studies in medical, chemical and agricultural sciences. Investigations ranged from the effectiveness of a powerful new oral drug for treatment of diabetes to the administration of tranquilizers to beef cattle.

Transmission of Tuberculosis

A herd of dairy cows that had previously tested negative to TB manifested positive reactions after a period of time. The fact that two cats stayed in the barn suggested the possibility of transmission of tuberculosis from cats to cattle. Both cats were killed and postmortem examinations were performed. Both revealed tubercular lesions in the lungs and ascites. From mucous in the bronchi and from abdominal fluid, TB bacilli were isolated.—*Veterinary Science News, Fall 1958.*

Simplified Gutzeit Test for Arsenic

FRED J. ROTH, T. W. JACKSON, D.V.M. and PAUL D. DeLAY, D.V.M.

California State Department of Agriculture and United States Department of Agriculture Sacramento, California and Plum Island, New York

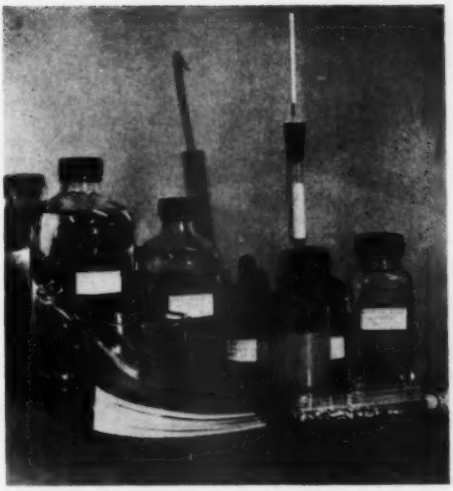
ARSENICALS are still used in weed and crop-control programs, although not as extensively as in the past since they have been supplanted by more recently developed chemicals.

When the arsenicals are used as weed-killer, they must be carefully applied to preclude drift of the spray and, although care is usually exercised in their application, losses among animals in the adjacent areas are occasionally encountered.

To meet the needs of veterinarians confronted with the problem of establishing the cause of mortality in animals with a history of possible exposure to arsenic, the following qualitative test is described as a rapid method which is sufficiently sensitive to detect sub-lethal doses of arsenic. The procedure is an adaptation of the Gutzeit test, a well-established method of examination for small amounts of arsenic.

One of the principal deviations from the usual application of the Gutzeit method is simplified preparation of the specimen for test. Although less of the arsenic from a given tissue specimen is ultimately obtained, adequate amounts are released for testing purposes.

Experimental data show that the test is sufficiently sensitive to detect sublethal doses in guinea pigs and a lethal dose in rabbits.



Chemical and equipment kit for rapid arsenic test. A sheet of treated strips and test tubes containing zinc are shown in the foreground. The three-part generator is shown in foreground, right.

The Test

Cut out a cube of liver about 3/8 in. each side. This should weigh between .5 to 1 gm. With forceps and scissors cut tissue in small pieces and place into glass mortar. Fill the graduated cylinder to the 35 cc. mark with the 1 plus 6 hydrochloric acid (100 cc. HCl plus 600 cc. water). Add a few drops of this to the material in the mortar. Pound (not necessarily grind) the material in the mortar to a homogeneous mass. Add a few more drops of acid and pound and homogenize some more. When a good homogeneous mass is obtained, add up to 20 cc. of the acid and stir in the mortar with the pestle. Pour into the bottle of the Gutzeit generator. The pouring lip on the mortar is adequate, therefore a funnel is not required. Add the remainder of the acid to the mortar, stir and wash into the generator.

Add approximately 5 cc. of the potassium iodide solution. Add 5 drops stannous chloride solution and mix by gentle swirling of the bottle. Add 3 drops capryl alcohol. Wet the bottom of a 1 1/2 in. dental roll with lead acetate solution. Permit any excess on the end to soak up into the pad, then place, wet end

down, in the center section of the Gutzeit generator and shake it down to the bottom end. Place the top tube on the generator and insert a sensitized strip into the tube. Add 10 gm. of zinc into the generator bottle and put the generator together. If foaming is excessive, rotate the bottle or tap it on the table.

The presence of a lethal dose of arsenic is indicated by an orange-brown stain on the bottom end of the sensitized strip less than 20 minutes after adding the zinc.

Equipment and Chemicals

Equipment necessary for this test can be secured from any supply house.

Arsenic apparatus, Gutzeit, modified AOAC.

Arsenic test paper strips (unsensitized) 512.

Mortar, glass-lipped, with glass pestle, cap. 2 to 4 oz.

Cylinder, graduated, 50 ml.

Beaker, Griffin, Pyrex, 50 ml.

No. 2, 6 in. (Johnson & Johnson) cotton dental rolls (from dental supply house).

Each 6 in. roll makes four 1½ in. rolls.

Hydrochloric acid, C.P. or A.R.

Potassium iodide crystals, C.P. or A.R.

Stannous chloride, crystal, C.P. or A.R.

Zinc metal, shot, reagent ACS, low in arsenic, lead and iron.

Lead acetate, crystal, neutral, C.P. or A.R.

Capryl alcohol — best grade obtainable (used as a defoamer).

The hydrochloric acid is used in the form of a 1 plus 6 dilution (100 cc. HCl plus 600 cc. water). All water should be distilled.

The potassium iodide is used as a 15% W/V solution (15 gm. weighed out and made up to 100 cc. of solution with water). This will yellow with age, but addition of stannous chloride in the Gutzeit generator removes this yellowness and does not affect the test.

The neutral lead acetate is used as a 5% W/V solution. It may be slightly cloudy when made up, but this will not affect its usefulness. A few drops of C.P. or A.R. grade glacial acetic acid (if available) added to the solution will clear up this cloudiness and yet not affect the test.

The stannous chloride is made up as a 40% W/V solution. To 10 gm. of the stannous chloride, add sufficient quantity of concentrated hydrochloric acid to make

TABLE 1. Effectiveness of Quick Arsenic Test on Arsenic-Fed Laboratory Animals

Animal and Approximate Weight	As_2O_3 Fed in mg.	Dosage in mg./kg.	Condition	Regular Long Method As_2O_3 Found in Liver ppm.	Quick Test Found
Guinea Pig 400 gm.	0.5	1.25	Survived. No visible internal lesions.	Less than 0.3	Nil
Guinea Pig 400 gm.	1.0	2.5	Survived. No visible internal lesions.	Less than 0.5	Nil
Guinea Pig 400 gm.	2.5	6.25	Survived. Stomach mucosa inflamed and hemorrhagic. No external symptoms.	32.0	Good Positive
Guinea Pig 660 gm. Healthier looking animal than the above.	4.0	6.06	Survived. No visible internal lesions.	18.0	Good Positive
Guinea Pig 401 gm.	4.0	10.0	Survived. Liver congestion. Stomach mucosa hemorrhagic.	71.0	Good Positive
Guinea Pig 498 gm.	8.0	16.0	Dead 9 hours after feeding. Symptoms: labored respiration, rough hair coat, dullness. Lesions: lungs congested and hyperemic. Liver congested. Stomach mucosa inflamed and hemorrhagic.	60.0	Good Positive
Rabbit Approx. 2000 gm.	100.0	50.0	Fed 9:30 a.m. Dead 2:00 p.m. Stomach mucosa inflamed. Large intestine distended with watery feces.	60.0	Good Positive

25 cc. of solution. Warm on a water bath, stirring until dissolved. Do not let the acid boil. Cool and pour into a one or two ounce brown dropper top bottle that has a plastic screwcap around the rubber dropper bulb. Do not use one with a metal cap. Keep away from direct sunlight and temperatures above normal room temperatures. Do not use a glass-stoppered bottle as the stopper often sticks and is hard to remove. This solution keeps about a year and should be renewed after that. This solution can be tested for exhaustion by adding two drops of the solution to five drops of strong tincture iodine or ten drops of weak tincture in a few cc. of water. The stannous chloride should discharge the iodine color.

The zinc used, approximately 10 gm. per test, is best handled by keeping a number of portions in cork-stoppered test tubes (½ in. inside diameter by 4 in.). This quantity will make the test tube about one-third full (8 to 12 gm.) which is sufficiently accurate for the test.

One may be able to obtain sensitized strips from an analytical laboratory, or they may be sensitized as follows:

"Dissolve 36 gm. of mercuric bromide (C.P. or A.R. grade) in 840 ml. of 95% alcohol by stirring. Filter the resulting solution into a glass cylinder of suitable size and soak the (Hanford-Pratt) strips for one hour, moving them about at intervals of ten minutes to release air bubbles and stir the solution. Remove the strips and string them on glass rods to dry. Stack dried sheets between clean paper and press under a book or weight overnight to straighten sheets. The mercuric bromide solution may be used repeatedly for at least three months, if filtered through paper immediately before using."

Discussion

In the experimental tests (table 1), sublethal dosages produced stains ¼ to ½ inch long and blanks on reagents only gave no stain.

This direct application of the Gutzeit test could be used for checking grasses for arsenical herbicides by putting one or two ¼ in. long pieces, (or ¼ to ½ square inches of leaf area) of grass directly into a Gutzeit bottle, without macerating in the mortar, adding the chemical solutions and zinc. The test can also be used for detecting the presence of arsenic in water.

Should the stain run the length of the tube, the reaction should be continued for an hour after addition of the zinc to flush out the equipment. Then the cleaned apparatus should be boiled in a large beaker or other glass vessel with some of the 1 plus 6 hydrochloric acid diluted 1 to 1, rinsed well with clear water and allowed to dry.

Conclusion

It has been shown that the Gutzeit test for arsenic can be simplified and used as a direct toxicological test rather than the usual long wet digestion procedure. This was proved on laboratory test animals. This simplification makes it possible for a veterinarian equipped with a simple kit to run the test in a few minutes in his office.

Humane Slaughter Methods

As required under the Humane Slaughter Act passed by congress recently, the Secretary of Agriculture designated approved method before March 1, 1959. Secretary Benson has named a 12-member advisory committee to assist in making the determination. Members of the group include representatives of national organizations of slaughterers, livestock growers, humane organizations, trade unions, the veterinary profession and the general public. One person familiar with requirements of religious faiths with respect to slaughter is also included. Packers who offer products for sale to the federal government must comply with adopted methods no later than July 1, 1960.

Editorial

OPEN LETTER to the GRADUATING CLASS of 1959

Within the next few days you will step forward and receive that long awaited diploma signifying that society recognizes you as a professional man. VETERINARY MEDICINE joins veterinarians all over the world in welcoming you as colleagues to a proud profession.

Completion of your professional studies marks the accomplishment of a long sought objective and the end of one important chapter of your life. This goal was not accomplished without sincere effort and in most cases self-sacrifice. As you prepare to tackle the next important chapter of your life, you are probably taking a little time to look over the ground you have just covered and establishing firmly your course and objectives for the future.

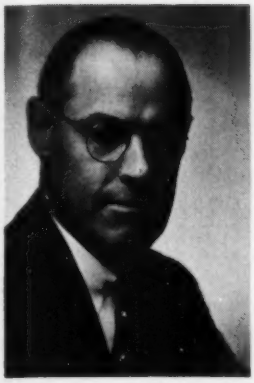
You are the best trained veterinarians ever to leave our schools. Like your faculty, the profession is proud of you and looks forward to your enthusiasm and vigorous contribution to the perpetual struggle for professional advancement.

Some old timers may say that your future does not look as rocky as that faced by young veterinarians of past generations but in reality the society and the profession expect more from you than at any time in history. The rapidly changing nature of agriculture has established rigid practice standards. Larger farm operations striving for maximum efficiency demand the kind of veterinary service that can be supplied only from modern group practices operating out of first class facilities. *Until veterinary service of the type and quality you have become familiar with in your college days is made available to all who desire it, our professional responsibility to society is not fulfilled.*

In the next few years many experiences will tend to weaken or destroy your present ardor. Don't give up your dreams easily or allow the complexities of everyday routine dampen your enthusiasm or blot out your professional goal. If ownership of a high quality hospital is your goal, fight tenaciously for it at the earliest possible time.

If you have any inclination toward advanced study, now is the time. Although the normal desire to get some practice experience is great, it grows increasingly difficult to return to school as the years roll by. The demand for veterinary specialists by all phases of industry, agriculture and research is almost unbelievable and promises to grow even greater in the next few years. In contrast to past years, the specialist can expect a substantial increase in earning power over the general practitioner. In fact, there is rapidly growing evidence that the quality practice of the very near future will demand specialists to properly serve modern agriculture.

Consider carefully the opportunities for further study available from our nation's veterinary schools. If this does not seem to fill the bill, look over the opportunities for specialization available from related fields of science such as agriculture, pharmacy and medicine.



Veterinary interest in professional management of money matters has prompted the editors of VETERINARY MEDICINE *to seek out experts in the field for a series of reports. This is the fifth report on investments and management of funds for future security.*

Professional Management

DWIGHT P. ROBINSON, JR.

Chairman, Massachusetts Investors Trust
Boston, Massachusetts

WHAT ARE THE REASONS for the attractiveness of mutual funds to so many investors? There are numerous reasons, but it has been our experience, especially in recent years, that when an investor buys the shares of any well-established mutual fund, one of his principal motives is to obtain the benefit of professional management.

Five Trustees

Typical of many mutual funds, Massachusetts Investors Trust is managed by its five trustees who are professionally trained in investment research and analysis and are responsible for the direction and supervision of all the trust's activities. They make the final decisions on additions to and changes in the trust's portfolio of securities. In all basic questions with respect to investments, the trustees are guided by a written statement of policy in effect for many years.

In the day-to-day work of investment analysis, which is the core of the trust's operations, the trustees are aided by a staff of "industry specialists." As this term indicates, each of these men is assigned to cover a particular group of industries in which the trust is interested. The group usually consists of two or three industries of major importance to the trust and one or two of less importance.

Work of Industry Specialists

The industry specialists spend a substantial percentage of their time away from the office in personal investigation of particular situations and each specialist calls at least twice a year on every company in which the trust is interested.

Providing the basic investment facts and up-to-date information needed in making investment decisions is the fundamental purpose of the research department's work but the final decisions are made by the trustees. In this process, however, the trustees are aided by the advisory board of the trust which meets with the trustees weekly.

Appraising Industry Outlooks

In addition to these meetings, at the weekly meetings with the Advisory Board, one of the specialists discusses an industry and presents his appraisal of the outlook together with a discussion of individual companies. Other members of the investment research department are present at these meetings. This procedure permits them to obtain an appraisal of industries other than the ones they follow and serves to keep them abreast of investment matters generally.

We are frequently asked what factors are used in evaluating a company for investment purposes. To some extent these factors vary according to the industry involved or the company in question, but generally speaking among the important ones are: the historical record of the company; the caliber of its management; the company's financial position and its future plans; current sales and earnings; profit margins; backlog of orders; the dividend policy; the competitive position of the company within its industry; and its record of labor relations.

All this background work is necessary to making prudent investment decisions and making prudent investment decisions is the essence of management work.

Conservative Medium

The term "a conservative medium" means that the trustees endeavor to use prudence, discretion and intelligence in their selection of investments with due regard to probable income and probable safety of capital. The words "high investment quality" indicate the intention to avoid speculative stocks or those of doubtful character even if immediate prospects might be tempting. Since the shares of the trust represent an investment in common stocks, every effort is made to have the shareholders understand that the price of the shares will go up or down with changes in the market value of the stocks held by the trust. The dividends paid by the trust will increase or decrease in relation to the amount of dividends received from these investments.

There are no preconceived ideas with respect to stocks selected. Any stock may be sold if a more attractive one is available for replacement. The stocks of well-known companies are naturally more prominent and numerous because of their known quality and their earnings' records, but there is a constant looking to the future towards enterprises which may be leaders later on.

Hood to Pitman-Moore Post

Frank Hood, Jr., Pitman-Moore Company chemist, has been named assistant director of pharmaceutical control, it was announced recently by the firm.

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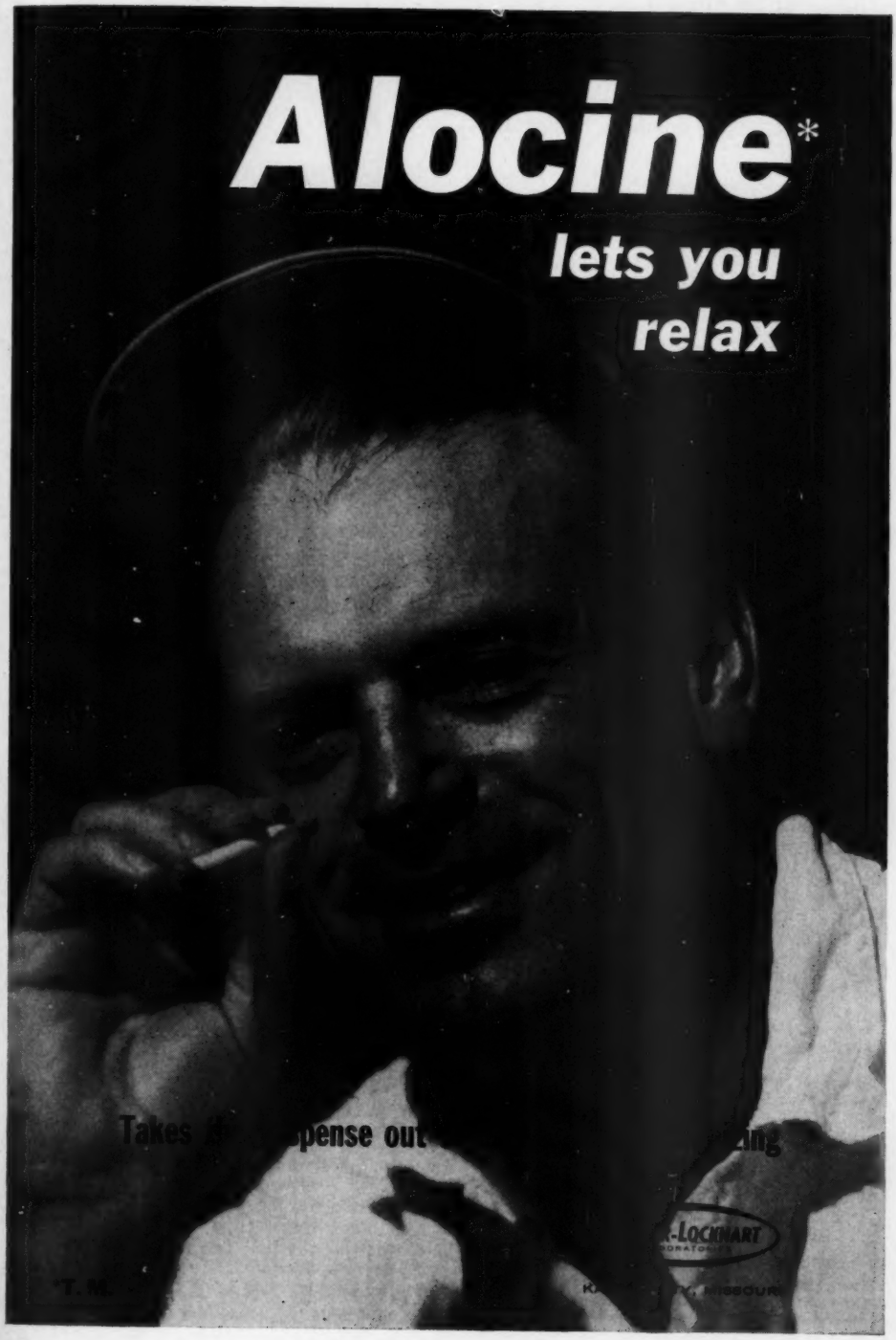
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Promotions at Allied Labs

Stewart E. Ruch, vice president and director of sales for Pitman-Moore Company, has been elected to the Board of Directors of the firm's parent company, Allied Laboratories, Inc.

Stewart E. Ruch

Ruch, a graduate of the Purdue School Of Pharmacy, joined Pitman-Moore Company as a medical service representative in 1940.

E. A. Cahill, Jr., has been named secretary of Allied Laboratories.

E. A. Cahill, Jr.

Cahill became associated with Allied Laboratories, Inc. in 1940 and except for a period of five years during World War II when he served in the U. S. Army, has been with the company continuously since that time.

Mr. Cahill will continue to headquarter in Kansas City.

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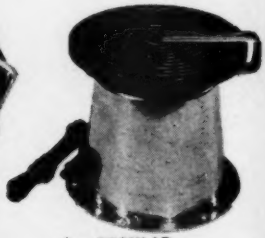

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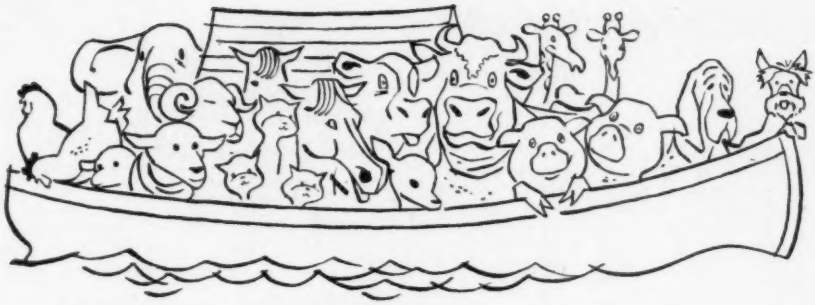

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*U.S. Patent No. 2,565,057

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Dosage: See CIBA Veterinary Therapeutic Index.

*Chambers, E. E.: N. Am. Vet. 37:105 (Feb.) 1956.

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Doctor Mitchell to New Post

Dr. Frank E. Mitchell has recently joined Pitman-Moore on its research staff as veterinary pathologist.

Dr. F. E. Mitchell

Doctor Mitchell attended Georgia Military College before entering the University of Georgia where he received his degree in veterinary medicine in 1955.

Doctor Mitchell was employed by the Georgia Coastal Plain Experimental Station for two years.

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100cc PFIZER Procaine Penicillin aqueous suspension 300,000 Units per cc expires January 1961	1 Vial	2.70
	5 Vials	12.50
	10 Vials	24.00
	100 Vials	230.00
10cc Dihydrostreptomycin Solution — ½ gm. per cc Expires January 1962	10 Vials	5.70
	100 Vials	52.00
	1000 Vials	480.00
100cc PFIZER Combiotic expires January 1962	1 Vial	4.95
	5 Vials	23.00
	10 Vials	42.50
	100 Vials	400.00

Penicillin Tablets — Soluble — 100,000 Units	100	1.35
	1000	12.00
	5000	53.00
Penicillin Tablets — Soluble — 200,000 Units	100	2.40
	1000	21.50
	5000	100.00
Penicillin with Triple Sulfas — 300,000 Units	100	4.00
	1000	36.00
5cc Acth-Gel — 40 units per cc Standard Brands	1 Vial	2.50
	10 Vials	22.50
	100 Vials	210.00
100 Chloromycetin Capsules 250mg		29.75
100 Chloromycetin Capsules 100mg		13.25
Prednisone or Prednisolone — 5 mg — Specify	100	4.10
	1000	36.00
	5000	170.00
10cc Vitamin B_{12} — 1000 Mcg. per cc Crystaline — U.S.P.	1 Vial	2.25
	10 Vials	20.00
	100 Vials	185.00
	1000 Vials	1750.00

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nationally known antibiotics, therapeutics, hormones, biologicals, vitamins and pharmaceuticals for all animals

when fluid losses occur...

"IN KIND"

PARENTERAL THERAPY

improves the prognosis

For Electrolyte Replacement:

IONOSOL® D-CM Solution
IONOSOL D-CM With Dextrose 5%
IONOSOL G (for gastric fluid replacement)
IONOSOL D (for duodenal fluid replacement)

For Protein Replacement—

AMINOSOL® 5% Solution
AMINOSOL 5% With Dextrose 5%

When body fluid losses and debilitating conditions complicate diseases or infections, prompt, "In Kind" fluid replacement offers the best possible supportive therapy. ■ Just as blood losses should be matched by replacement with blood, and plasma losses by plasma replacement . . . so should gastric and duodenal fluid losses be replaced with balanced, "In Kind" electrolyte solutions. ■ A complete line of highest quality, highest purity "In Kind" parenteral solutions is available to the veterinarian through the Veterinary Department of Abbott Laboratories. ■ These—and many other parenteral solutions—are available from the Veterinary Department, Abbott Laboratories, North Chicago, Illinois; your Abbott representative or your distributor.

Abbott

Ideal for operating room or laboratory—a new wall chart of "Abbott Parenteral Solutions For The Modern Veterinary Medical Practice." Write, or ask your Abbott representative for copies.

® IONOSOL—Electrolyte Solution For Injection, Abbott.
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in small
or
large
animals...

Quiescence with Safety

The effectiveness of ataractic agents in favorably modifying mood and behavior of animals is now firmly established. However, the side-effects associated with many of these agents have precluded their use in some areas of veterinary medicine.

SPARINE has been used successfully in horses,[1,2] cattle,[2] swine,[3] cats,[4] and dogs.[3,5,6] SPARINE may be safely and dependably used whenever an animal's potential for aggressively defensive actions must be reduced.

It is particularly indicated in reducing weight losses of cattle shipped from range to feed lot and as an adjunct in major and minor surgery.

AVAILABLE: INJECTION: 50 mg. per cc., vials of 10, 30 and 100 cc.
TABLETS: 25, 50, 100 mg., vials of 50.

REFERENCES: 1. Raker, C.W., and English, B.: J.A.V.M.A. *134*:19-24 (Jan. 1) 1959 (2 papers). 2. Schulz, W.W.: Vet. Med. *53*:73, 1958. 3. Nelson, A.J.: Vet. Med. *53*:356, 1958. 4. Clifford, D.H.: J.A.V.M.A. *131*:415 (Nov. 1) 1957. 5. Gradess, M.: Vet Med. *51*:587, 1956. 6. Krawitz, L.: Vet. Med. *52*:442, 1957.

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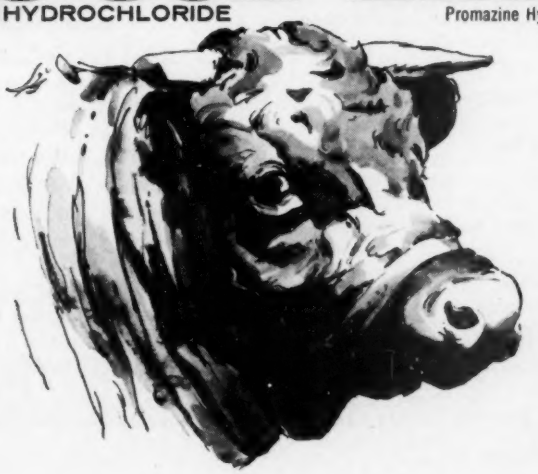
Wyeth®
Philadelphia 1, Pa.

INJECTION
Sparine®
HYDROCHLORIDE

Promazine Hydrochloride, Wyeth



infected eyes and ears respond rapidly to

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brand of nitrofurazone

Wide-spectrum, non-irritating nitrofuran in formulations especially adapted for the treatment of bacterial infections of the

eye

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SOLUBLE POWDER VETERINARY

"FURACIN in its water-soluble base is completely soluble in body fluids. These properties make it ideally suited for the treatment of ophthalmitis and postoperative therapy."*

FURACIN Soluble Powder Veterinary is conveniently applied directly from the plastic puff-bottle.

These FURACIN products contain FURACIN 0.2% in water-miscible vehicles. Therefore, they may be left in wounds to be sutured.

Order plastic "puff" bottle of 10 Gm.
Available through your professional veterinary distributor.

ear

FURACIN
EAR SOLUTION VETERINARY

This anhydrous, water-soluble dosage form of FURACIN affords prompt relief of otic infections in small animals.

In canine otitis externa, poor drainage, plus the trauma of scratching and rubbing, often frustrates therapy. It is noteworthy that "FURACIN has been used successfully in this condition . . ."*

In cases of otitis in which exudate is present, you will find the drying effect of FURACIN Soluble Powder Veterinary to be most beneficial.

Available in dropper bottle of 1 fl.oz.

*Belloff, G. B.: Calif. Vet. 9:16 (Nov.-Dec.) 1956.

NITROFURANS — a new class of antimicrobials—neither antibiotics nor sulfonamides

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F. D. A. Announces New Head

Appointment of Charles G. Durbin, V.M.D., as Veterinary Medical Director of the Food and Drug Administration's Bureau of Medicine was announced recently by Deputy Commissioner of Food and Drugs, John L. Harvey. Doctor Durbin succeeds the late Dr. John H. Collins.

Doctor Durbin has been Associate Director of the Veterinary Medical Branch since the fall of 1953. From 1949 until 1952 he was engaged in parasite research for the Zoological Division of the Bureau of Animal Research of the USDA. He transferred to the Food and Drug Administration in 1952 to take charge of its therapeutic testing laboratory at Beltsville, Md.

Doctor Durbin attended Temple University and the University of Pennsylvania School of Veterinary Medicine, receiving the V.M.D. degree from the latter in 1949. He did graduate work at the University of Maryland in Virology and Zoology. In World War II he served with the United States Army in an evacuation hospital in Italy.

You'll do better with Oster the Veterinarian's Clipper

Model A-2

Humane, efficient clipping and surgical shaving are easier, faster and more profitable with the smoother-running OSTER clipper. Detachable cutter head permits use of all sizes of cutting blades to do all clipping jobs the professional way.

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CURTS **MULTI-SCOUR** CURTS

"Junior" Bol-Tabs

— 5 active ingredients with 5-way action in treating calf scours —

Phthalylsulfacetamide	20 gr.	Inhibits infection
Sulfathiazole	20 gr.	Adsorbs toxins
Tannins (extracted)	20 gr.	Coagulant
Alumina hydrate	20 gr.	Demulcent
Compound chalk powder	20 gr.	Antacid

Distinctive formula—size—shape—color—Available only from the Veterinarian—Your client will return to you for scour medication.

Enthusiastically used—recommended—dispensed by Veterinarians throughout the country. **MULTI-SCOUR** is a money-maker for the clinical practitioner.

Suggested dose: To each 150 pounds body weight—4 or 5 bol-tabs the first day and 2 or 3 the second day. Continue or repeat if or as necessary.

Package: Cartons of 100 and 500

order from your nearest CURTS distributor or direct

CURTS Laboratories, Inc.

Manufacturers of Veterinary Pharmaceuticals Since 1918

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PRO DIET FOODS

LP (low protein)
HP (high protein)
BLAND GI (gastro-intestinal)
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CAT
HORSEMEAT

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35 years of experience.

Write for literature and prices.

Shipment made direct from plant to hospital.

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C. Pedrick, D.V.M.

Examinations

Florida

The Florida State Board of Veterinary Examiners will hold an examination June 15-17, 1959 at the Biscayne Terrace Hotel, Miami, Florida. All inquiries should be addressed to Dr. E. L. Matthews, Secretary of the Board, Box 141, Palatka, Florida.

Gray Named Wyeth V. P.

Dr. B. J. Gray has been named vice president in charge of biological and pharmaceutical production for Wyeth Laboratories. He succeeds John D. Cash who is retiring after 18 years of service with the company and 30 years in the pharmaceutical manufacturing industry.

Doctor Gray has served as assistant to the president of the firm since January 1, 1959. Prior to that, he was president of Fort Dodge Laboratories, Inc.

for Small and Large Animals

Metrazol

A quick-acting, powerful Antianesthetic and Respiratory — Circulatory Stimulant

Prevents and overcomes respiratory and circulatory inadequacy prior to or during surgery. Hastens post-operative recovery. Overcomes shallow respiration and sluggish circulation in old, toxic and debilitated animals when given orally.

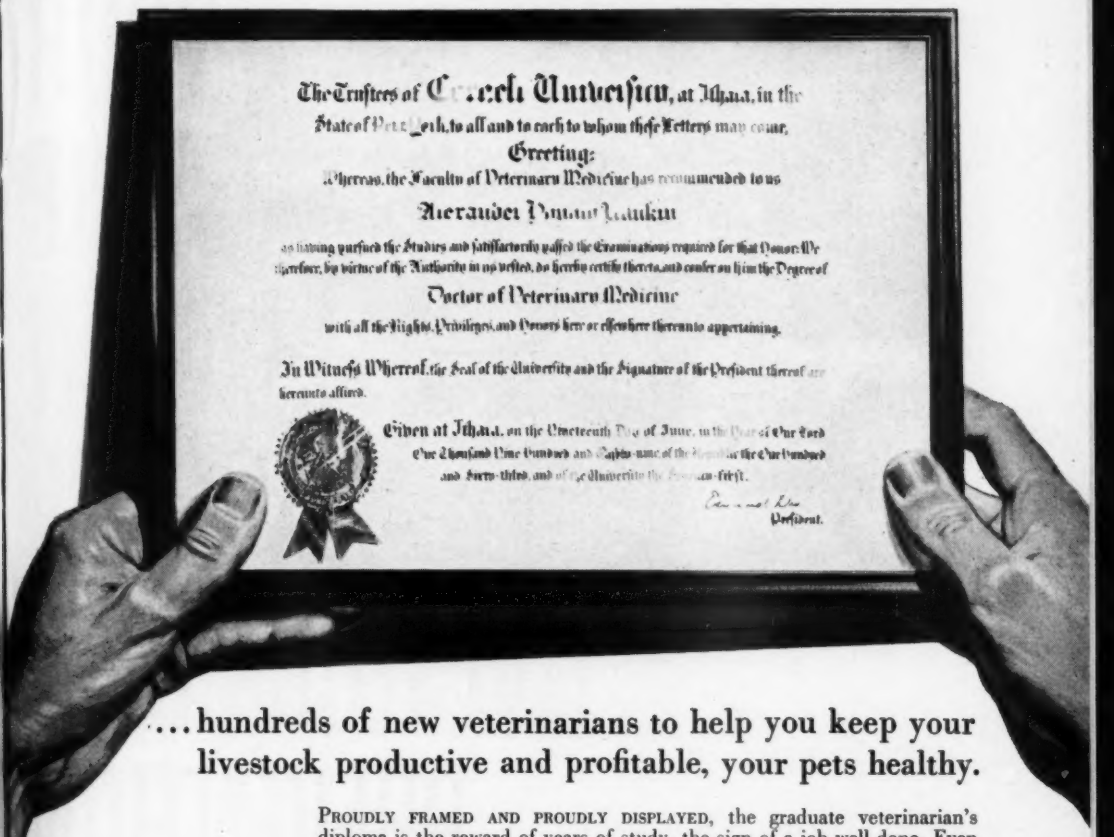
Dose: Small animals ½ to 3 cc. METRAZOL by injection, as necessary.
One METRAZOL tablet orally three or four times a day.
Large animals 10 to 25 cc., intravenously, repeated as required.

Available in: Ampules, (100 mg. per cc.) 1 cc., 6's and 100's.
Sterile Vials (100 mg. per cc.) 30 cc. and 100 cc.
Oral Tablets, 0.1 Gm. (1½ grs.) each, 100's, 500's and 1000's.

Metrazol®, brand of pentylenetetrazol, E. Bilhuber, Inc.

KNOLL PHARMACEUTICAL COMPANY ORANGE NEW JERSEY

Every year hundreds of new diplomas go up


The Trustees of Cornell University, at Ithaca, in the
Greeting:
Whereas, the Faculty of Veterinary Medicine has recommended to us
Alexander Duncan Lamkin
Doctor of Veterinary Medicine
with all the Rights, Privileges, and Honors here or elsewhere thereunto appertaining.
In Witness Whereof, the Seal of the University and the Signature of the President thereof are hereunto affixed.
Given at Ithaca, on the Fifteenth Day of June, in the Year of Our Lord
and Forty-third, and of the University the
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...hundreds of new veterinarians to help you keep your livestock productive and profitable, your pets healthy.

PROUDLY FRAMED AND PROUDLY DISPLAYED, the graduate veterinarian's diploma is the reward of years of study, the sign of a job well done. Even more important, it signifies the start of a *new* job . . . the all-important job of helping you keep your livestock productive and profitable, your pets healthy and vigorous.

It's a great day for the new veterinarian—the day he begins his professional practice. And for his community, this man and his diploma mean that expert training and skill are on call when and where they're needed.

The new veterinarian, like the veterinarians already established in practice, is a specialist in livestock health. Through his all-embracing program of Animal Health Engineering, he brings to your farm or ranch the most recent advances in the science of breeding and raising animals for profit. He's rigorously schooled in the techniques of disease prevention, diagnosis and treatment. He's a skilled surgeon. He's a good friend and neighbor.

When he treats one of your animals, he may choose a drug bearing the Squibb label. When he does, trust Squibb to market drugs only of the highest purity, safety, potency and efficacy. Remember the words which have stood behind every Squibb product for more than 100 years: SQUIBB — A NAME YOU CAN TRUST.

This Squibb advertisement in full color, is one of a series appearing in Farm Quarterly and Successful Farming, stressing Animal Health Engineering as practiced by veterinarians

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SQUIBB — A NAME YOU CAN TRUST

YOUR STAKE IN NATIONAL LIVESTOCK LOSS PREVENTION Y

ASSOCIATED VETERINARY LABORATORIES

Sponsors of American Foundation for Animal Health

1959 National LIVESTOCK LOSS PREVENTION Year

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YEAR

Every veterinarian stands to benefit from the great, national drive now being conducted under the title "National Livestock Loss Prevention Year." This effort has two objectives:

- *to arouse farmers to the enormous losses they now sustain due to livestock diseases.*
- *to emphasize the value of veterinary service in checking these losses.*

Through newspapers, farm magazines, radio, television, and co-operating organizations, this campaign by American Foundation for Animal Health is being underwritten by the member companies of Associated Veterinary Laboratories . . . See names of companies listed at the left.

latest addition to the "Meti" family

for allergic and inflammatory skin conditions threatened or complicated by secondary infection

- decreases scratching, spread of lesions and self-mutilation
- applies easily — saves clients the bother and mess of rub-on lotions or ointments
- dries almost instantly, washes off easily, does not stain clothing or fabrics
- delivers economical film of medication, all of which acts directly on the irritated skin

Schering
50 Gm.
Meti-Derm
Aerosol c̄ Neomycin
VETERINARY
Caution: Federal law restricts this drug to sale by or on the order of a licensed veterinarian.
Professional literature available on request.
For Dermatologic Use Only in Cats and Dogs
Store in a cool place.
SCHERING
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METI-DERM,® brand of prednisolone topical.
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V-L-827

Why Purina Micro-Mixing is important to you

Mass administration of a medicament for the prevention or treatment of disease, or for the control of parasites, is done best when it is blended with a commercial feed. Because of that fact, Purina Micro-Mixing is important to you as a means of accurate dosage.

Micro-Mixing was developed by Purina Scientists and Engineers. It blends medication with Chows to the accuracy of a prescription . . . even when only minute quantities of a medicinal are added to a ton of Chow.

Purina Micro-Mixing is tested by a method so accurate that it can detect one part of a test material in ten million. That is why you can depend on the Checkerboard.

Purina's medicated chows serve best when their use is based upon an accurate diagnosis.

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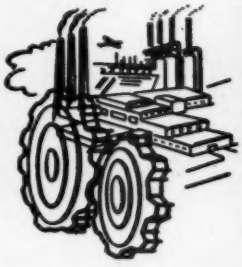
To Acquire Shares of United Accumulative Fund

offer you investment units in multiples of $2,500 with investments as low as . . . $125 Initially and $25 Periodically. Under a United Periodic Investment Plan you invest in



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a diversified, managed mutual fund with investments in over 100 American corporations.

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"OFFICES COAST TO COAST"

Veterinary Calendar

May 28. **Wisconsin Veterinary Medical Association,** regional conference on nitrofurans in veterinary medicine. Hotel Loraine, Madison, Wisconsin. Dr. H. J. O'Connell, Wisconsin Veterinary Medical Association, 1215 Vilas Avenue, Madison 5, Wisconsin, chairman.

Jun. 4-5. **Texas A. & M.,** 12th annual Texas Conference for Veterinarians. College Station, Texas. Dr. R. D. Turk, conference chairman.

Jun. 9-11. **Montana Veterinary Medical Association,** annual meeting. Butte, Montana.

Jun. 14-15. **Wyoming Veterinary Medical Association,** annual meeting. Sheridan, Wyoming. Dr. J. F. Ryff, P.O. Box 960, Laramie, Wyoming, secretary.

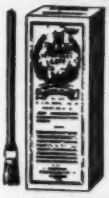
Jun. 16-17. **Ohio State University, College of Veterinary Medicine,** annual spring conference. Columbus 10, Ohio.

Jun. 17-18. **Utah Veterinary Medical Association,** annual meeting. Provo, Utah.

Jun. 18-20. **Animal Reproduction Symposium.** University of Illinois, Urbana, Illinois. Dr. P. J. Dzuik, III Animal Genetics, University of Illinois, Assistant Professor of Animal Physiology.

Jun. 20-22. **Idaho Veterinary Medical Association,** annual meeting. Moscow, Idaho.

M·A·C



Quick relief for Bone, Bursal or Tendon Lameness

Single Bottle.....$2.00
3 and 1 free.....5.00
6 and 2 free.....9.00
12 and 4 free.....17.00
24 and 4 free.....28.00

CARTER-LUFF CHEMICAL CO.
Hudson, N. Y.

Jun. 21-23. **California Veterinary Medical Association,** 71st annual convention. Miramar Hotel, Santa Monica, California. (On June 24, a group of members will leave on a 10-day adjourned meeting in Hawaii.) Executive Secretary, 3004 16th Street, San Francisco, California.

Jun. 23-25. **North Carolina Veterinary Medical Association.** Morehead Biltmore Hotel, Morehead City, North Carolina. Dr. J. T. Dixon, 3026 South Main Street, Winston-Salem, North Carolina, secretary-treasurer.

Continued on page LIII

FORMULATED FOR EFFECTIVENESS

A Veterinary Exclusive in Therapeutic Feed Supplements

Economical

TERRAMIX® A-B-D-25

oxytetracycline with vitamins

Vitamin-enriched—A, B_{12}, D_3 and riboflavin

Broad-spectrum antibiotic—oxytetracycline

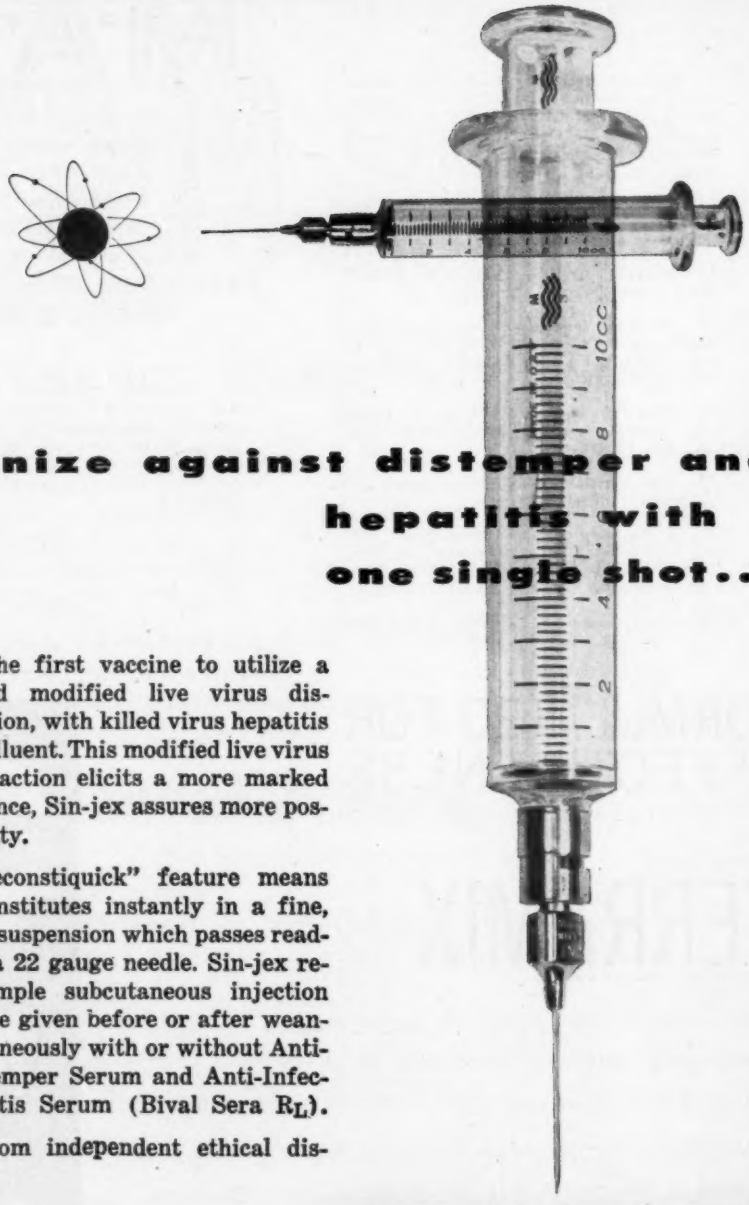
Designed to support your initial therapy in herds and flocks

ECONOMICAL • CONVENIENT • EFFECTIVE

Available as: Terramix A-B-D-25—5 pound canister—125 Grams
Sold to Veterinarians only

Pfizer *Science for the world's well-being*

Department of Veterinary Medicine
PFIZER LABORATORIES, Division, Chas. Pfizer & Co., Inc.
Brooklyn 6, N. Y.



immunize against distemper and hepatitis with one single shot...

Sin-jex is the first vaccine to utilize a vacuum-dried modified live virus distemper fraction, with killed virus hepatitis fraction as diluent. This modified live virus distemper fraction elicits a more marked response; hence, Sin-jex assures more positive immunity.

The R_L "reconstiquick" feature means Sin-jex reconstitutes instantly in a fine, homogenous suspension which passes readily through a 22 gauge needle. Sin-jex requires a simple subcutaneous injection which may be given before or after weaning—simultaneously with or without Anti-Canine Distemper Serum and Anti-Infectious Hepatitis Serum (Bival Sera R_L).

Available from independent ethical distributors.

Research Laboratories, Inc.
St. Joseph, Missouri

distemper hepatitis
sin-jex
vaccine

CALENDAR . . . *continued*

Jun. 23-25. **Maritime Veterinary Associations,** joint conference. Mount Allison University, Sackville, N. B. Dr. P. D. McKercher, Box 310, Sackville, N. B., general chairman.

Jun. 25-26. **Maryland State Veterinary Medical Association,** summer meeting. George Washington Hotel, Ocean City, Maryland. Dr. Harry L. Schultz Jr., Baltimore, Maryland, secretary-treasurer.

Jul. 10-12. **Nebraska Veterinary Medical Association,** summer meeting. Pawnee Hotel, North Platte, Nebraska. Dr. H. E. Hedlund, Wahoo, Nebraska, program chairman.

Jul. 13-14. **Kentucky Veterinary Medical Association,** 48th annual convention. Sheraton-Seelbach Hotel, Louisville, Kentucky. Dr. L. S. Shirrell, 545 East Main, Frankfort, Kentucky, secretary.

Jul. 19-22. **Alabama Polytechnic Institute,** 52nd annual conference for veterinarians. School of Veterinary Medicine, Auburn, Alabama. (Housing facilities will be available for married couples.) Dr. J. E. Greene, A.P.I., Auburn, Alabama, dean.

Jul. 20-22. **Canadian Veterinary Medical Association,** annual convention. Ontario Veterinary College, Guelph, Ontario, Canada. Dr. H. J. Neely, Ontario Veterinary College, Guelph, Ontario, chairman.

Continued on page LV

Veterinarians Prefer the NEW

Sunbeam STEWART CLIPMASTER ANIMAL CLIPPER

More Powerful Motor . . . 25% greater speed

CLIPS Dogs, Horses Cows, Mules faster, better

Clip your animals the fast, easy way with the new Sunbeam Stewart electric Clipmaster animal clipper. Has quiet, powerful, air-cooled, ball-bearing motor inside the cool Easy-Grip handle. Anti-friction tension control assures perfect tension between blades, provides easy adjustment. **No. 51, $49.95,** (Colorado & West, **$50.25).**

Special bottom clipping blades for all breeds of dogs.

Bottom Clipping Blade. Individually packed. Catalog **No. 84AU.** Shpg. wt. 5 oz. **$3.15**

Top Clipping Blade. Individually Packed. Catalog **No. 83AU.** Shpg. wt. 3 oz. **$2.65.**

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THE FULLY GUARANTEED LINE FOR VETERINARIANS

ABSOLUTELY SAFE—100% EFFECTIVE

TROPICAL CONCENTRATED **TICK KILLER**

New pleasant odor. Guaranteed 100% effective against even resistant or immune species. Kills fleas in minutes; kills ticks, including engorged females, in a few hours. Excellent residual action. Non-irritating.

ACTIVE INGREDIENTS: Methylated Napthalenes, Pine Oil, Malathion, Rotenone, other cube resins, emulsifiers.

TROPICAL CONCENTRATED **FOAM CLEANER**

A neutral skin and fur cleaner. Contains no alkali, no soap. Rinses clean fast. Gives superior foaming, kills fleas in five minutes. Dilute with equal parts water for using or dispensing.

ACTIVE INGREDIENTS: Neutral cleaning and foaming agents, Hexachlorophene, Lanolin Esters, Piperonyl Butoxide, Pyrethrin.

YOUR OWN PRIVATE LABEL AT **NO EXTRA CHARGE** available on all Florida Veterinary Laboratories Co. products.

FLEA POWDER FOR DOGS • FLEA POWDER FOR CATS • TICK SALVE • FOAM CLEANER NEW AEROSOL PET SPRAY • TICK AND FLEA SPRAY • KENNEL DUST.

FLORIDA VETERINARY LABORATORIES CO.
Division of Pet Chemicals, Inc.
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FOR
NUTRITIONAL
CONTROL
OF WEIGHT LOSS
IN

Hospital Feeding

A foundation product for preparation of menus for dogs with individual dietary requirements. Dispensed only by graduate veterinarians.

A "PRESCRIPTION DIET"

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FOR FEEDING
INDIVIDUAL PATIENTS

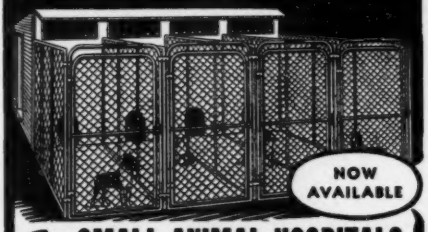
PRESCRIPTION DIETS DEPT., HILL PACKING CO., TOPEKA, KANSAS

k/d p/d r/d i/d c/d f/d

CALENDAR . . . *continued*

Jul. 26-28. **Arkansas Veterinary Practitioner's Association,** annual meeting. Mather Lodge, Petit Jean State Park, Morrilton, Arkansas. Dr. W. H. Babbitt, 204 East 13th Street, North Little Rock, Arakansas.

MASON'S *New* KENNEL RUNS



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For SMALL ANIMAL HOSPITALS

Quickly Erected - NO POSTS REQUIRED

Can be set on concrete or wood floors or directly upon the ground, joining to, or independent of Building. Composed of strong, self-supporting Fence sections and Gate Units with GATES BUILT-IN and Lockable Latches.

FREE CATALOG

Send for Free Catalog with Low Direct Factory Prices of Kennel Fences of all kinds, Kennel Doors, Cages and Hospital Equipment.

THE MASON FENCE CO., Box 77, LEESBURG, OHIO

"CAP-CHUR" EQUIPMENT

Automatic projectile type syringe delivered by a specially designed pneumatic rifle.

Excellent for immobilizing, capturing, restraining or treating wild or feral animals.

Effective for animals of all sizes. From one to ten milliters of any liquid compound can be injected into an animal from distances up to approx. 50 yards.

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ATLANTA 3, GEORGIA, U.S.A.

MORE EFFECTIVE MASTITIS THERAPY

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LIQUAMAST*

oxytetracycline HCl

1. Maximum Antibiotic Levels in Milk
2. Disperses Immediately
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5. Nonirritating
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SUPPLY: ½ oz. tubes—426 mg. of oxytetracycline HCl packaged in a 12-tube carton with one tube squeezer. Sold to Veterinarians only.

Pfizer *Science for the world's well-being*

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IOMYCIN now in 3 sizes

Now there's a member of the IOMYCIN family to meet every size need . . . Bulk . . . Regular . . . and Small Animal. And each size is the same remarkable antibiotic that provides up to 5 times greater respiratory—mammary tissue concentrations that last eight to twelve hours.

Iomycin Bulk New big size for big herd problems provides greater economy and faster handling. Each vial restores to 125 cc of solution-suspension containing 20,000,000 units Diethylaminoethylesterpenicillin-Ghydriodide and 25 grams dihydrostreptomycin base as sulfate. Supplied in 125 cc vials.

Iomycin Small Animal Iomycin in new small dose vials especially for small animal practice. Each vial restores to 2.5 cc containing 400,000 units diethylaminoethylesterpenicillinGhydriodide and 500 mg dihydrostreptomycin base as sulfate. Supplied in boxes of 6—2.5 cc vials.

Iomycin Regular The original vial size, Iomycin Regular is a convenient size to carry for practice calls—for large jobs or small. Each vial restores to 12.5 cc containing 2,000,000 units of diethylaminoethylesterpenicillinGhydriodide and 2.5 grams of dihydrostreptomycin base as sulfate. Supplied in 12.5 cc vials.

Sterile diluent q. s. in each package

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DELEGON® POWDER IMPROVED

Antiseptic Dressing Powder

AN IMPROVED DUSTING POWDER THAT NOW CONTAINS SULFAMYLON® AND NEOMYCIN.

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